

CONFIDENTIAL

DECLASSIFIED
Authority DDO 34869

NAVWEPS OP 3352

GROUP 3

Downgraded at 12-year intervals;
not automatically declassified.

**AIM-9D GUIDED MISSILE
(SIDEWINDER 1C)**

DESCRIPTION, OPERATION, AND HANDLING

(U)

NOTICE: This material contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

**PUBLISHED BY DIRECTION OF
THE CHIEF OF THE BUREAU OF NAVAL WEAPONS**

CONFIDENTIAL

1 DECEMBER 1964

LIST OF EFFECTIVE PAGES

Total number of pages in this publication is 60 consisting of the following:

<u>Page</u>	<u>Issue</u>
Title	Original
A	Original
Foreword	Original
iii thru x	Original
1-1 thru 1-4	Original
2-1 thru 2-11	Original
2-12 blank	Original
3-1 thru 3-8	Original
4-1 thru 4-9	Original
4-10 blank	Original
5-1 thru 5-12	Original
6-1 thru 6-3	Original
6-4 blank	Original

FOREWORD

NAVWEPS OP 3352 describes the AIM-9D (Sidewinder 1C) guided missile, lists shipping containers, assembly tools, and handling and testing equipment, and gives assembly procedures.

The handling and operating instructions for the AIM-9C guided missile are given in OP 3351. OP 3353 is the pilot's handbook for AIM-9C and AIM-9D missiles.

CONTENTS

Chapter	Page
1 INTRODUCTION	1-1
1-1 AIM-9D Guided Missile System	1-1
1-2 Performance of the AIM-9D	1-1
1-3 Missile Components	1-2
1-4 Training Components	1-2
1-5 Containers for Missile Components	1-2
1-6 Assembly Equipment and Tools	1-2
1-7 Handling Equipment	1-3
1-8 Testing Equipment	1-3
1-9 Launching Equipment	1-3
1-10 Ancillary Equipment	1-3
1-11 Aircraft	1-3
1-12 Referenced Documents	1-3
2 PHYSICAL DESCRIPTION	2-1
2-1 Guidance and Control Group	2-2
2-2 Fuzes	2-2
2-3 Warhead	2-3
2-4 Motor	2-3
2-5 Wing Assembly	2-6
2-6 Aircraft Launching System	2-6
2-7 LAU-7/A Launcher	2-6
2-8 Passive Filtration and Charging Unit	2-9
2-9 Training Components	2-10
3 FUNCTIONAL DESCRIPTION	3-1
3-1 Proportional Navigation	3-1
3-2 Guidance and Control Group	3-1
3-3 Fuzes	3-6
3-4 Warhead	3-7
3-5 Motor	3-7
3-6 Aircraft Launching System	3-7
3-7 Launching Equipment	3-7
4 SHIPPING, HANDLING, AND STOWAGE	4-1
4-1 Shipping Containers	4-1
4-2 Assembly Equipment and Tools	4-4
4-3 Handling Equipment	4-4
4-4 Receiving Inspection	4-8
4-5 Stowage	4-9

Chapter	Page
5 OPERATION	5-1
5-1 Decanning	5-1
5-2 GCG and Fuze Assembly Operation	5-1
5-3 Assembly Area Operation	5-3
5-4 Sequence of Assembly Steps and Manpower Requirements	5-6
5-5 Missile-Launcher Operation	5-7
5-6 Handling and Disposition of Physically Damaged AIM-9D Missile Components . . .	5-11
5-7 Handling and Disposition Instructions for Misfired AIM-9D Missiles	5-11
6 MAINTENANCE AND TESTING	6-1
6-1 Test Set, Guidance-Control Mk 409	6-1
6-2 Guided Missile Launcher Test Set AN/ASM-20	6-2

ILLUSTRATIONS

Figures

1-1. AIM-9D (Sidewinder 1C) Guided Missile	x
2-1. AIM-9D (Sidewinder 1C) Guided Missile, Exploded View	2-1
2-2. Guidance and Control Group Mk 18 Mod 2	2-2
2-3. Fuze Components of the AIM-9D Missile	2-2
2-4. Warhead Mk 48 Mod 0	2-3
2-5. Warhead Mk 48 Mod 0, Exploded View	2-4
2-6. Motor Mk 36 With Wings and Rollerons.	2-4
2-7. LAU-7/A Launcher	2-7
2-8. Gas Receiver (Coolant Tank)	2-8
2-9. Passive Filtration and Charging Unit Model 1012A	2-9
2-10. Passive Filtration and Charging Unit Model 1012B	2-10
2-11. Passive Filtration and Charging Unit, Flow Diagram	2-11
3-1. Principles of Proportional Navigation	3-2
3-2. Block Diagram of the Mk 18 Mod 2 GCG	3-3
3-3. Reticle Pattern	3-3
3-4. Head-Coil Assembly	3-4
3-5. Gas System for the LAU-7/A Launcher, Block Diagram	3-8
4-1. Mk 241 Mod 1 Container for Mk 18 GCG	4-2
4-2. Fin Container	4-2
4-3. TDDs in Outer Container	4-3

Figures	Page
4-4. S-As in Inner Container	4-3
4-5. S-As in Outer Container	4-3
4-6. Warhead Container	4-3
4-7. Motor Container (With Motor Ready to Ship) . .	4-4
4-8. Assembly Stand	4-4
4-9. Tools Used in Decanning and Assembly	4-5
4-10. Aero 8C-1 Adapter on Aero 12B Bomb Skid . .	4-6
4-11. Aero 30A Kit (Vibration Isolation Unit)	4-7
4-12. Aero 9B Adapter on Aero 12B Bomb Skid . . .	4-7
4-13. Aero 39B Adapter With Coolant Tanks	4-8
4-14. Transport Tray for GCG	4-8
5-1. Assembly Procedures for the AIM-9D Missile	5-5
5-2. Missile-Launcher Assembly Procedures	5-10
6-1. Test Set, Guidance-Control Mk 409 With GCG in Place	6-1
6-2. Guided Missile Launcher Test Set AN/ASM-20	6-3

TABLES

Table

4-1. Containers for AIM-9D Missile Components . .	4-1
5-1. Assembly Procedures and Manpower Requirements	5-6

SAFETY SUMMARY

GENERAL PRECAUTIONS

In handling, assembly, and stowage of the AIM-9D missile, the precautions given in OP 5, Ammunition Ashore, dated 9 August 1957, and in OPNAV 34-P1, U.S. Navy Safety Precautions, dated June 1953, shall be observed. Certain other general precautions are given below:

1. Make sure that the firing system of the aircraft cannot be energized during launcher loading and unloading operations.
2. Keep well away from the front and rear of the missile as it is being loaded on, and unloaded from the launcher.
3. Do not smoke within 200 feet of ordnance.

MISSILE-COMPONENT PRECAUTIONS

The S-A, warhead, and motor of the AIM-9D are potentially dangerous ordnance material and shall be treated in accordance with existing regulations. Specific WARNINGS are repeated from the text for the protection of personnel.

WARNINGS

No electrical checks are to be made on the S-A by handling personnel. (Page 5-1)

The S-A contains sensitive explosive and must be handled with care. Do not drop the S-A or attempt to assemble an S-A to a TDD if the S-A has been damaged, has been dropped, or is suspected of having been dropped. Such an S-A shall be repacked and instructions for its disposition requested from the Bureau of Naval Weapons. No tests, adjustments, or checkout procedures shall be made by handling personnel, except visual inspection of the SAFE-ARMED indication in the window of the S-A.

Always grasp the S-A at the end close to the retainer ring. Keep handling of the S-A to a minimum. (Page 5-1)

Do not use an S-A if by visual inspection (a) it is found to be in the ARMED position, or (b) it cannot be determined to be in the SAFE condition. (Page 5-2)

When the S-A is assembled to the GCG and TDD, the unit shall be handled with the care given any item of explosive ordnance. (Page 5-2)

Do not alter or attempt to repair any part of the motor or igniter. Avoid jarring or dropping the motor. A cracked grain may cause motor blowup on firing. Do not use a motor that has been dropped or has a damaged (punctured or cracked) nozzle weather seal. Do not probe or punch weather seal with fingers or tools. Reject any motor that has been dropped or damaged, and dispose of it in accordance with existing instructions. (Page 5-3)

The warhead is potentially dangerous ordnance material and should be handled in accordance with existing ordnance regulations for Class A explosives. Do not perform any alterations on the warhead or attempt to disassemble any of its parts. If a warhead is damaged, it shall be disposed of in accordance with local instructions. (Page 5-4)

Do not stand directly in front of or behind the missile during loading operation. Stand clear of the launcher at all times after the missile is loaded on the launcher. VERIFY the safe condition of the launcher and aircraft before loading the missile on the aircraft by checking that the detent wrench-safety pin is installed properly, that cockpit switches are OFF, that aircraft engine is OFF, that auxiliary power is NOT connected to the aircraft, and that the aircraft is grounded. (Page 5-8)

Do not stand directly in front of or behind the missile during unloading operation. (Page 5-9)

The detent wrench—safety pin is installed in the launcher as soon as possible after an aircraft lands with AIM-9D missiles aboard. (Page 5-9)

The following CAUTIONS are repeated from the test because if not strictly followed the effectiveness of the missile and equipment may be destroyed.

CAUTIONS

Detonators in the S-A are of the bridgewire variety and are not safe when subjected to current of more than 5 ma. For example, a Simpson meter delivers enough current during tests to initiate the detonators. (Page 5-1)

A cable connects the TDD with the GCG, and lock screws on the cable plug must be removed before the TDD is separated completely from the GCG. Use care in removing the TDD. Do not damage the TDD or the windows of the TDD. (Page 5-2)

Lift TDD by its forward end. Do not pull on plastic bag alone. (Page 5-3)

Do not remove the protective tape from the windows of the TDD, and do not remove the red plastic cap from the electrical connector. (Page 5-3)

Failure to assemble warhead and motor properly can result in rocket motor failure and missile breakup near the firing aircraft, which may cause missile components to strike the aircraft. (Page 5-4)

Handle coolant tanks with care at all times. It is essential that the seal valve at the forward end of the coolant tank be kept free of sand, dust, oil, grease, water, and other contaminants. NEVER APPLY ANY OIL, GREASE, OR OTHER LUBRICANTS TO THE LARGE THREADS ON THE SEAL VALVE. (Page 5-7)

Never leave the launcher unattended with the aft fairing open. (Page 5-8)

Do not use excessive force or supplemental leverage in depressing the nose latch button on the launcher. (Page 5-8)

The forward-receptacle dust cap must be kept in place on the launcher-power-supply receptacle at all times when a missile is not installed on the launcher. The upper-receptacle dust cap must be on the aircraft-pylon receptacle on the launcher top side WHENEVER the launcher is removed from the aircraft.

(Page 5-9)

CONFIDENTIAL

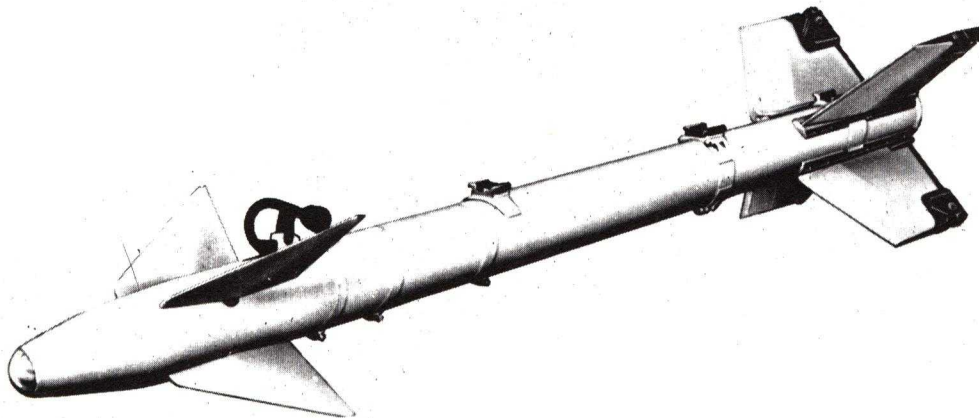


Figure 1-1. AIM-9D (Sidewinder 1C) Guided Missile.

CONFIDENTIAL

Chapter 1

INTRODUCTION

1-1 AIM-9D GUIDED MISSILE SYSTEM

The AIM-9D guided missile (figure 1-1) is a supersonic, air-launched missile employing passive infrared target detection, proportional-navigation guidance, and a torque-balance control system.

The infrared optical system has a cooled (77°K) detector that is sensitive in a region of the infrared spectrum that makes it possible to discriminate against background reflections and to home on jets with low-temperature exhausts or shielded tail pipes. The nose of the guidance section is streamlined to reduce aerodynamic drag. The seeker telescope (1.8 inches in diameter) has a 2.5-degree field of view and a gimbal angle of 40 degrees in any direction.

The proportional-navigation guidance system and torque-balance servo are powered during flight by a gas generator that provides 60 seconds of guided flight.

The AIM-9D is propelled by the Mk 36 solid-propellant motor, which boosts it to approximately Mach 2.5 above launch speed. A nonpropulsive head closure on the motor blows out if the motor is accidentally ignited without the warhead attached, making the motor nonpropulsive. The motor also has an RIF (radio interference filter) in the igniter circuit for increased safety in the presence of high-energy radiation.

Aerodynamic lift for the missile is provided by four wings in a cruciform

configuration. Rollers on each wing provide pitch and yaw damping, and reduce roll rate. Airframe maneuvering is accomplished by four canard fins mounted in line with the wings and activated by the torque-balance servo system.

The AIM-9D has two alternate target-detecting devices (TDDs) — infrared (IR) and radio frequency (RF). The safety-arming device (S-A) is used with either TDD. A TDD and an S-A constitute a fuze. Either fuze has influence and contact capability. In the contact fuze system, the firing voltage is developed by lead zirconate titanate crystals (PZT) located in the rocker arms of the guidance fins. The crystal output initiates the firing of the detonators of the S-A.

Initiated by either contact or influence fuze action, the warhead explodes into a continuous ring of steel that expands at an initial speed of 4000 feet per second to a maximum diameter of 34 feet. The warhead is insensitive to high temperature, and its lethality is not impaired by the thin atmosphere at high altitudes.

1-2 PERFORMANCE OF THE AIM-9D

The AIM-9D is effective against aircraft operating in the Mach 2 region and up to 80,000-foot altitudes. The AIM-9D is best suited to attack from a tail-on position. The present ground-controlled intercept (GCI) and

airborne early warning (AEW) can usually achieve a more reliable tail attack than frontal attack.

Through an audio tone the missile seeker tells the pilot that it sees the target. The pilot then determines, by using the aircraft radar, GCI, or similar equipment, or by visual estimates, that he is within the firing envelope. He fires the missile and then immediately breaks away. No post-launching maneuver is required.

1-3 MISSILE COMPONENTS

The AIM-9D missile components are as follows:

- Guidance and Control Group Mk 18 Mod 2
- Fuze (IR) Mk 323 Mod 0
 - Target-Detecting Device Mk 24 Mod 0
 - Safety-Arming Device Mk 13 Mod 0
- Fuze (RF) Mk 322 Mod 0
 - Target-Detecting Device Mk 15 Mod 0
 - Safety-Arming Device Mk 13 Mod 0
- Warhead Mk 48 Mod 0
- Motor Mk 36
- Wing Assembly Mk 1 Mod 0

1-4 TRAINING COMPONENTS

The components of the AIM-9D used in training are as follows:

Dummy Missiles Types I, II, and III

1-5 CONTAINERS FOR MISSILE COMPONENTS

The AIM-9D components are shipped in the following containers:

Guidance and Control Group Container Mk 241 Mod 1 (two units to a container)

TDD (IR or RF)

Inner container, polyethylene bag (one unit to a bag)

Outer Container Mk 129 Mod 0 (four units to container)

S-A

Inner Container Mk 127 Mod 0 (four units to inner container)

Outer Container Mk 2 Mod 0 (20 units to outer container)

Warhead Container Mk 386 Mod 0 (two units to a container)

Rocket Motor Container Mk 287 Mod 0 (one unit to a container)

Fin shipping and stowage container no mark or mod (12 units to a container)

Wing Assembly Container Mk 418 Mod 0 (eight units to a container)

1-6 ASSEMBLY EQUIPMENT AND TOOLS

In the assembly of the AIM-9D, the Sidewinder assembly stand and the following tools are provided:

- 6 speed wrenches, 3/16 inch
- 2 special screwdrivers
- 1 can wrench (for GCG container)
- 1 bottle wrench (for gas receiver assembly)
- 6 socket-head wrenches (Allen), 5/32 inch
- 2 spanner tube wrenches (for S-A)
- 1 torque wrench (100 inch-pound)

1-7 HANDLING EQUIPMENT

The equipment required to transport and stow the AIM-9D components and missiles is as follows:

- Aero 12B bomb skid
- Aero 8C-1 adapter
- Aero 9B adapter
- Aero 39B adapter
- Aero 30A kit
- Transport tray (for GCG)

1-8 TESTING EQUIPMENT

The equipment used in testing the GCG of the AIM-9D missile is the Test Set, Guidance-Control Mk 409 Mod 0. The LAU-7/A launcher and aircraft circuits are checked with the Guided Missile Launcher Test Set AN/ASM-20.

1-9 LAUNCHING EQUIPMENT

The equipment required for preparing the missile for flight is as follows:

- LAU-7/A launcher with gas receiver assembly (coolant tank)
- Passive filtration and charging unit

1-10 ANCILLARY EQUIPMENT

Other items provided for the protection and safety of components are listed as follows:

- Dome cover with caging ring
- TDD cover
- Rolleron caps

1-11 AIRCRAFT

Aircraft to be used with the AIM-9D missiles are as follows:

F8-D	F4-B
F8-E	F4-C
	A6-A

The A7-A aircraft are to be delivered to the Fleet with all provisions to use AIM-9D.

Check the pilot's handbook (OP 3353) and applicable aircraft handbooks for the model of aircraft involved.

1-12 REFERENCED DOCUMENTS

The following publications contain current information on the components of the AIM-9D, as well as the equipment used in testing and launching the missile;

1. Bureau of Naval Weapons. AIM-9C (Sidewinder 1C) Guided Missile; Description, Operation, and Handling (U). 1 December 1964. NAVWEPS OP 3351, CONFIDENTIAL.

2. Bureau of Naval Weapons. Pilot's Handbook for the Sidewinder 1C (AIM-9C and AIM-9D) Air-to-Air Guided Missiles (U). 1 December 1964. NAVWEPS OP 3353, CONFIDENTIAL.

3. Bureau of Naval Weapons. Guided Missile Launcher Model LAU-7/A, Handbook of Operation and Maintenance Procedures, NAVWEPS 11-75A-26; Handbook of Overhaul Instructions, NAVWEPS 11-75A-27; and Illustrated Parts Breakdown, NAVWEPS 11-75A-28 (Latest Revisions).

4. Bureau of Naval Weapons. Test Set, Guidance-Control Mk 409; Operation and Maintenance, NAVWEPS 17-15MBD-1 (Latest Revision).

5. Bureau of Naval Weapons. Guided Missile Launcher Test Set AN/ASM-20, NAVWEPS 16-30ASM-20-1 (Latest Revision).

6. Bureau of Naval Weapons. Handbook of Operation, Service, and Maintenance Instructions and Illustrated Parts Breakdown, Passive

Filtration Unit, NAVWEPS 19-25D-20;
Parts List, Air-Cooled, High-Pressure Air Compressors, NAVWEPS 19-35-2; Operating Instructions for Model 4R15, High-Pressure Compressor, NAVWEPS 19-35-23 (Latest Revisions).

7. Bureau of Naval Weapons.
General HERO Restrictions for Ordnance, NAVWEPS 16-1-529 (Latest Revision).

CONFIDENTIAL

Chapter 2 PHYSICAL DESCRIPTION

Major characteristics of the AIM-9D are an ogive nose for reducing drag, thereby contributing to the increased range of the missile; an improved motor that provides more total impulse for increased range; enlarged fins and wings for greater maneuverability and stability; a new photodetector cell that accepts long-wavelength radiation; and a cryostat

for cooling the detector to obtain the high sensitivity.

The AIM-9D missile is approximately 114 inches in length and 5 inches in diameter and weighs approximately 195 pounds. It is composed of four major sections: GCG, fuze (TDD and S-A), warhead, and motor, figure 2-1.

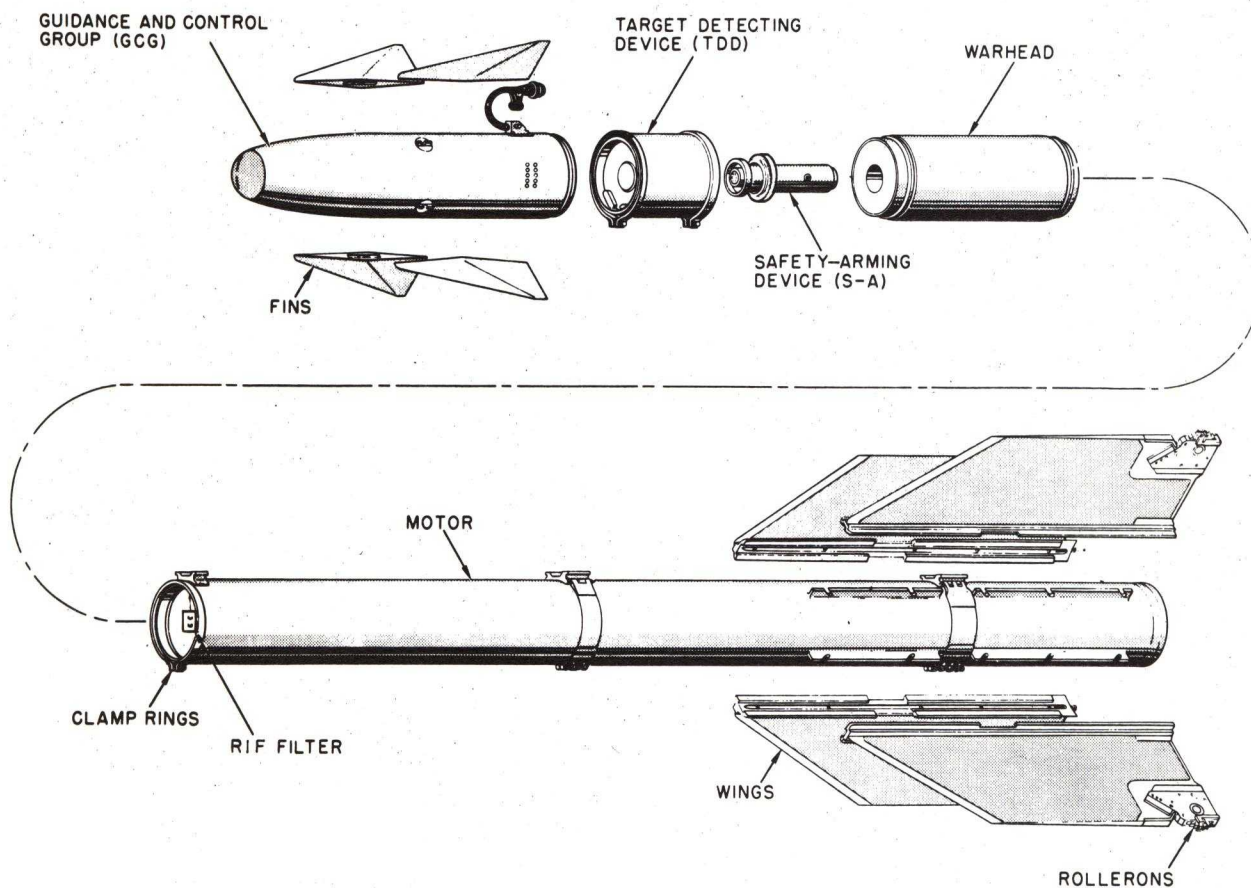


Figure 2-1. AIM-9D (Sidewinder 1C) Guided Missile, Exploded View.

CONFIDENTIAL

2-1 GUIDANCE AND CONTROL GROUP

The forward part of the AIM-9D missile is the GCG. Alternate GCGs are provided for all-weather nose-on or tail-on attacks. The Guidance and Control Group Mk 18 Mod 2 is shown in figure 2-2.

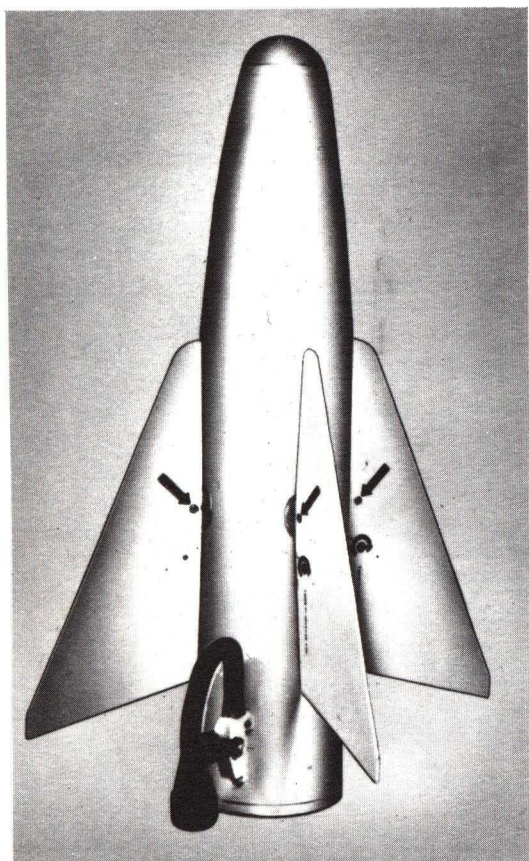


Figure 2-2. Guidance and Control Group Mk 18 Mod 2.

The major components of the infrared GCG are the gyro telescope, head-coil assembly, refrigerated detector unit (RDU), nitrogen-control-valve circuit, carrier amplifier, precession amplifier, motor-drive circuit, magnetic amplifier, servo (gas generator, manifold, turbogenerator, pistons, and rocker arms), and quick-attach canard fins. The GCG Mk 18

is approximately 25 inches in length and 5 inches in diameter and weighs 36 pounds. With fins attached, the GCG Mk 18 has an over-all span of approximately 16 inches and weighs 38 pounds.

2-2 FUZES

The AIM-9D can use two alternate influence fuzes — Mk 323 Mod 0 (IR) or Mk 322 Mod 0 (RF). Either fuze can be used with either GCG. The fuze is located at the after end of the GCG and forward of the warhead. The fuze consists of two parts: the Target-Detecting Device Mk 24 (IR) or the Target-Detecting Device Mk 15 (RF) and the Safety-Arming Device Mk 13, figure 2-3. The S-A, which fits into the recess of the warhead, is used with either TDD. The TDD has clamp rings at each end for clamping it to the GCG and to the warhead-motor assembly. The Mk 24 TDD is attached to the IR GCG Mk 18 when received; the TDD Mk 15 is shipped separately.

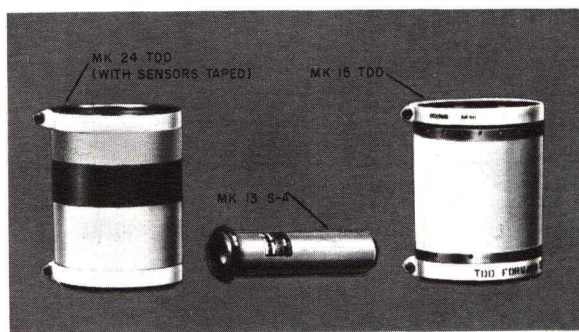


Figure 2-3. Fuze Components of the AIM-9D Missile.

Major internal parts of the Mk 24 TDD are (1) an integral reserve-type (Thermal Battery Mk 70 Mod 0) power supply, (2) an optical detector assembly, and (3) an amplifier assembly that includes the TDD firing circuits.

Major internal parts of the Mk 15 TDD are (1) integral reserve-type (Thermal Battery Mk 70 Mod 0) power supply, (2) an RF oscillator assembly, and (3) an amplifier assembly that includes the TDD firing circuits.

Major internal parts of the Mk 13 S-A are (1) an interrupted explosive train that contains 1.778 grams of high explosive, (2) a distance-measuring mechanism, and (3) associated electrical switches and circuitry. The Mk 13 S-A has a window for viewing the SAFE-ARMED indicator.

The physical dimensions of the fuze components are as follows:

	Length (in.)	Diameter (in.)	Weight (lb)
TDD Mk 24	6.75	5.0	8.5
TDD Mk 15	6.75	5.0	9.5 approx
S-A Mk 13	7.10	1.5	1.4

2-3 WARHEAD

The AIM-9D missile has a continuous-rod warhead that is exceptionally destructive at all altitudes and will function normally in high temperatures created by aerodynamic heating. The warhead, located between the fuze and the motor, is recessed to accept the S-A of the fuze.

The Mk 48 Mod 0 warhead, figure 2-4, is 13 1/2 inches in length and 5 inches in diameter and weighs approximately 25 pounds. Of this total weight, the pressed HMX-nylon high explosive weighs approximately 6 1/2 pounds. An integral booster is located in the closure assembly in the center of the explosive charge. An exploded view of the components of the warhead is shown in figure 2-5.

The following information is stenciled on the loaded warhead:

BUWEPS (drawing number) _____
 EXPLOSIVE (type) _____
 EXPLOSIVE WT. (lbs) _____
 TOTAL WT. (lbs) _____
 LOADING ACTIVITY _____ LOT NO. _____
 DATE OF LOADING (month and year) _____



Figure 2-4. Warhead Mk 48 Mod 0.

2-4 MOTOR

The after section (propulsion unit) of the AIM-9 missile is the Motor Mk 36, figure 2-6. The motor is approximately 70 inches in length and 5 inches in diameter and weighs approximately 99 pounds. With wings attached, the wing span is approximately 25 inches and the weight of the motor is increased to 123 pounds.

2-4.1 MOTOR TUBE. The motor tube is made of steel of 160,000-psi yield (minimum) and 6 per cent elongation (minimum). The wall of the tube is 0.060 inch thick. Each motor tube is hydrostatically tested at 3300 psi before loading. The seamless tube is manufactured by an extrusion process.

The motor tube is a thin-walled, high pressure vessel and is, therefore, very sensitive to cuts, deep scratches, or sharp dents. The solid propellant is bonded to the thin wall of the motor tube, and it too can be damaged if the motor is supported

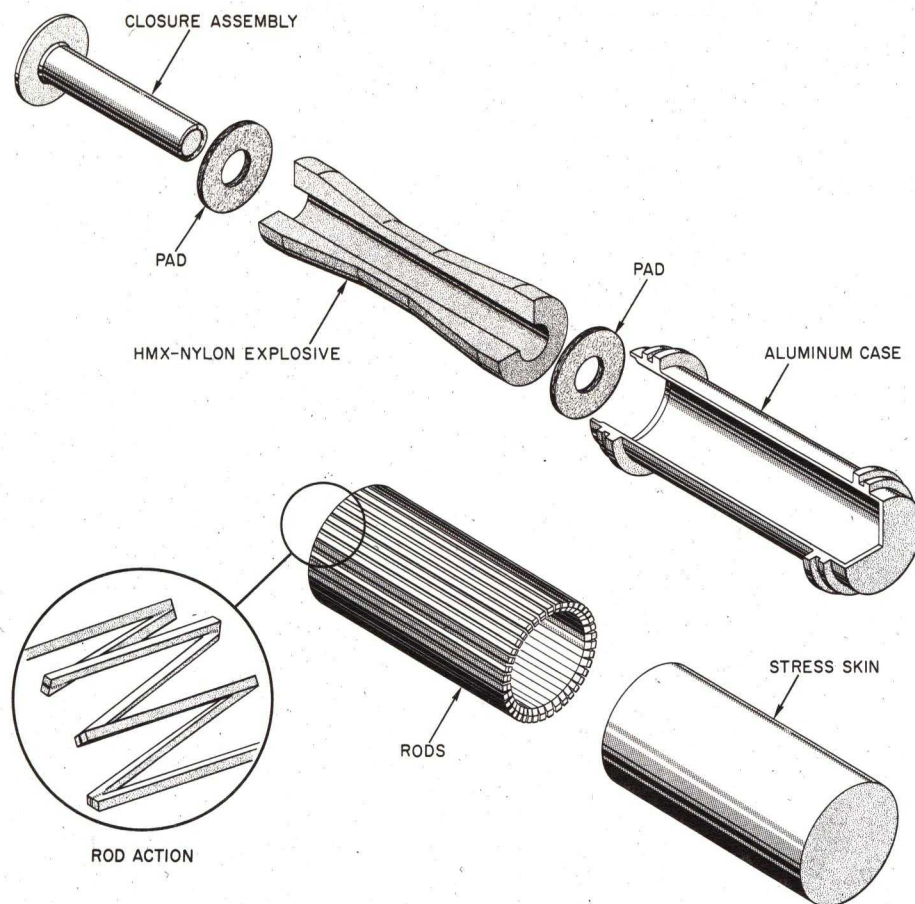


Figure 2-5. Warhead Mk 48 Mod 0, Exploded View.

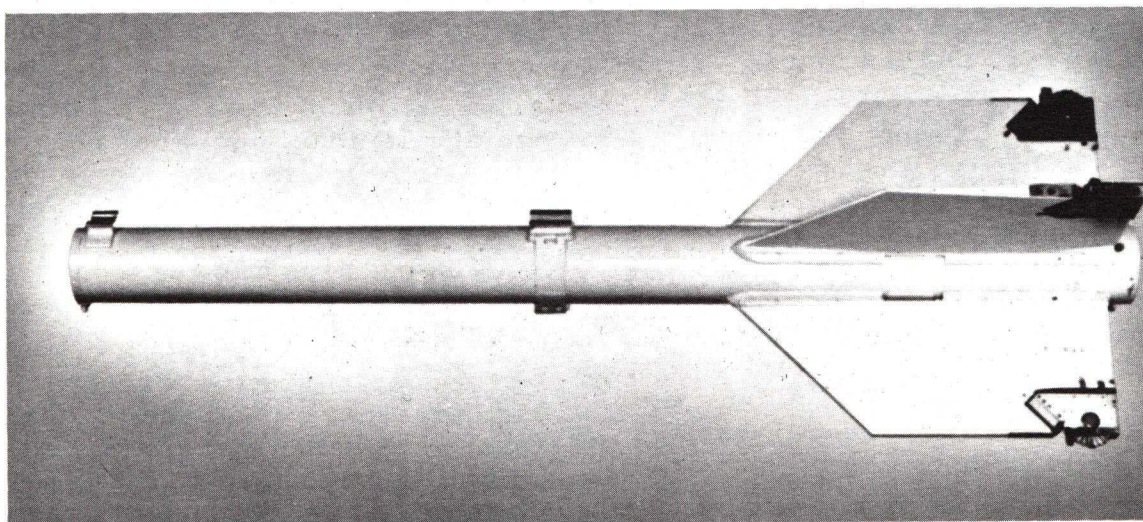


Figure 2-6. Motor Mk 36 With Wings and Rollerons.

CONFIDENTIAL**PHYSICAL DESCRIPTION**

on a sharp edge of a surface or if the motors are stacked when not in their containers. Therefore, the motors must be handled carefully to prevent damage to the tube wall. Any motor that has been dropped or subjected to rough handling shall be rejected immediately.

2-4.2 PROPELLANT GRAIN. The propellant is a carboxyl terminated polybutadiene rubber (Flexadyne) and contains 16% aluminum. The propellant has a brittle point of -115°F and an autoignition point of 498°F. The propellant is cast into the motor tube and case-bonded to the motor tube wall.

2-4.3 IGNITER. The igniter contains, as a main charge, an extruded cruciform grain (approximately 47 grams) of Teflon and Viton, which is ignited by a 1-gram booster charge. The booster is initiated by the Mk 5 squib. The hot gases and particles are exhausted through four holes in the sides of the igniter tube onto the internal surface of the propellant grain, causing the propellant to ignite. The igniter is held in place by a non-propulsive head closure that will blow out if the motor is ignited when the warhead is not in place, making the motor nonpropulsive.

2-4.4 NOZZLE. The nozzle consists of a steel backup ring with a phenolic-asbestos expansion cone molded to it. The nozzle throat is made of graphite to reduce the erosive effects of the exhaust gases. A weather seal of phenolic asbestos is bonded between the graphite throat and the expansion cone to keep moisture out of the motor.

2-4.5 MOTOR IDENTIFICATION. On the left side at the forward end of the motor, a decal has the following information:

ROCKET MOTOR MK 36 MOD _____
PART NO. _____ SERIAL NO. _____
STORAGE TEMP. RANGE -65° TO +165°F
OPERATING TEMP. RANGE -65° TO +165°F
DATE OF MFR. _____ LOADED WT. _____ LBS
CONTRACT NO. _____
GOVERNMENT INSP. _____ MFR. INSP. _____

The motor is also stenciled "WARNING DO NOT ROLL, TUMBLE, OR DROP."

Special motor designations may, from time to time, appear on the left side center of the motor. These markings assign that particular motor to specific test or evaluation use. Rocket motors bearing these special designations on the left side center are to be used as designated only, unless otherwise directed by the Bureau of Naval Weapons.

2-4.6 OPERATING CHARACTERISTICS. The major operating characteristics of this motor are as follows:

Performance

Thrust, normal operation, at 70°F
at sea level, lb 2645
Specific impulse, lb-ft-sec/lb-min,
av 231
Total impulse, lb-ft-sec,
minimum at 70°F 13,968
Burning time, sec, at 70°F 5.2

Operating Temperature, °F -65 to 165

Storage temperature, °F -65 to 165

Flight limitations

Recommended maximum firing
altitude, ft 80,000
Aerodynamic heat
at Mach 1.7 (130°F) Indefinite
at Mach 2.0 (230°F) 10 minutes
at Mach 2.25 (280°F) 6 minutes

CONFIDENTIAL**2-5**

Storage time limit, yr 5

Weight

Before firing, lb 99.01
After firing, lb 38.61

Center of gravity (measured from the leading edge of the forward hanger)

Before firing, in. 35.958
After firing, in. 35.643

2-4.7 HAZARDS OF ELECTRO-MAGNETIC RADIATION TO ORDNANCE (HERO). The Mk 36 motor contains a radio interference filter (RIF) that protects it from being accidentally ignited by RF energy. The missile may be operated under the general HERO restrictions for all ordnance given in NAVWEPS 16-1-529 (Latest Revision).

2-5 WING ASSEMBLY

Four wings are attached to the after end of the motor (see figure 2-6). Each wing has a rolleron which is protected by a plastic cap. The plastic cap is removed just before aircraft takeoff.

2-6 AIRCRAFT LAUNCHING SYSTEM

The AIM-9D missile is fired like a conventional rocket and uses cockpit equipment and switches with which the pilot is familiar. The pilot's handbook (OP 3353) and applicable aircraft handbooks are to be used as references for aircraft launching instructions.

2-7 LAU-7/A LAUNCHER

When attached to an aircraft, the LAU-7/A launcher provides a self-contained launching system for the AIM-9C, AIM-9D, and AIM-9B (with an umbilical adapter). The launcher

secures the missile in captive flight and releases it when it is fired by the pilot. A solenoid-operated detent lock prevents accidental missile release during arrested landings. A safety pin prevents accidental ground firing. During flight, snubbers and a detent prevent movement of the missile relative to the launcher. A high pressure gas system is incorporated to cool the AIM-9D missile detector. Full description of this launcher is given in NAVWEPS 11-75A-26 (Latest Revision).

The LAU-7/A launcher, figure 2-7, consists of housing assembly, umbilical support assembly, gas system, mechanism assembly, power supply, electrical system, and forward and aft fairings.

2-7.1 PHYSICAL DIMENSIONS.

The physical dimensions of the LAU-7/A launcher are as follows:

Over-all length, in.	111
Height, in.	5.5
Width, in.	4
Launcher weight (including power supply and 4 lb of gas), lb	87
Distance between mounting bolts, in.	30 ± 0.005
Gas receiver weight (empty), lb	11
Gas receiver weight (charged to 3000 psig), lb	15

2-7.2 GAS SYSTEM. The gas system consists of a gas receiver assembly, seal valve, and control valve. A cooling switch in the cockpit manually operated by the pilot energizes the control valve. This allows gas to flow to the missile through a tube in the missile umbilical cable. Gas flow for continued operation is controlled by a thermostat with sensing elements in the RDU.

2-7.3 GAS RECEIVER ASSEMBLY. The gas receiver assembly, located in the aft section of the LAU-7/A

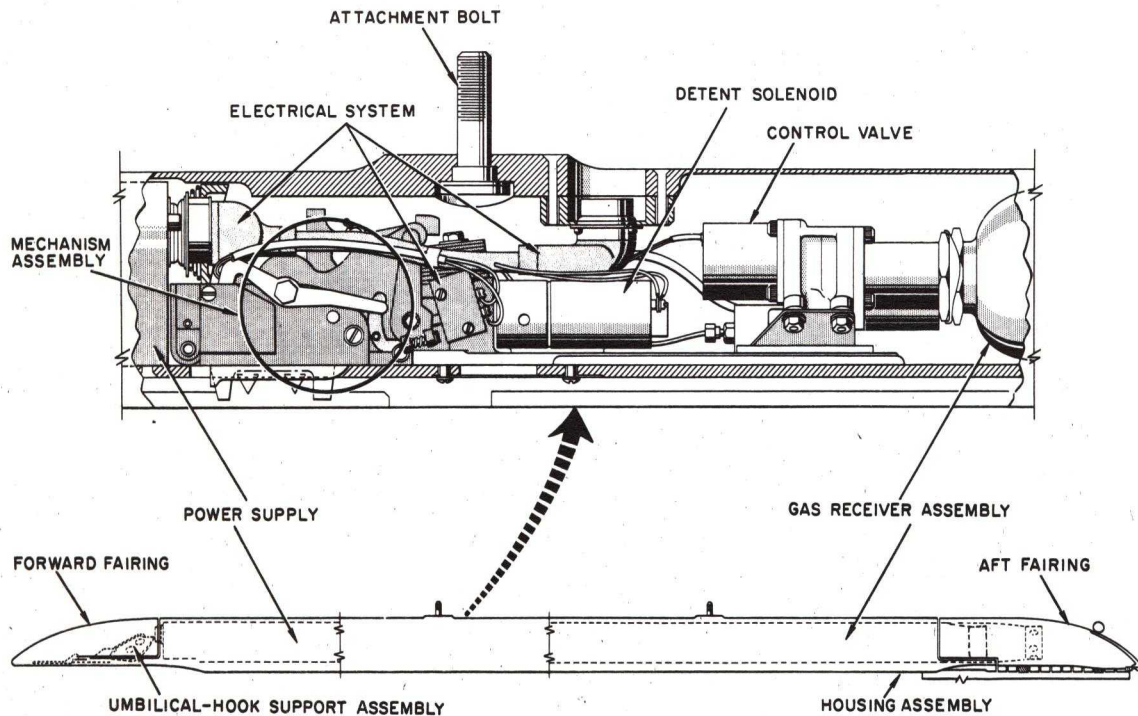


Figure 2-7. LAU-7/A Launcher.

launcher housing assembly, consists of a 1/4-cubic foot high pressure steel coolant tank (bottle), three valves, and a gage. Two valves, located on the aft end of the tank, figure 2-8, provide for charging and bleeding the tank and for relieving excessive pressure. The gage, adjacent to the valves, gives pressure readings. The forward end of the tank is threaded to match the threads of the control valve.

Before a gas receiver assembly is received by the Fleet, it will have been proof-tested to 5500 psig. The gas receiver assembly has a safety valve that releases at 5000 ± 250 psig.

2-7.2.3 Control Valve. The control valve, located at the aft end of the mechanism assembly inside the launcher housing, consists of a normally closed solenoid valve and a mechanical filter. The solenoid valve is electrically operated by the

cooling switch in the cockpit and turns on and off the flow of gas from the tank to the missile. A second normally open valve is located in the detector unit of the missile. This valve is thermostatically controlled to admit coolant to the detector when required.

2-7.3 MECHANISM ASSEMBLY. The mechanism assembly, located in the midsection of the housing assembly, consists of one set of snubbers, a detent, a control valve, a wiring harness, and a solenoid with an interconnecting detent-locking linkage. The mechanism assembly retains the missile during flight, delivers the firing current to the missile, and releases the missile when it is fired. The snubbers and detent prevent relative movement of the missile while it is on the launcher. The solenoid-operated detent lock (sear) prevents the forward lug of the detent from rising, thus retaining the missile during arrested landings.

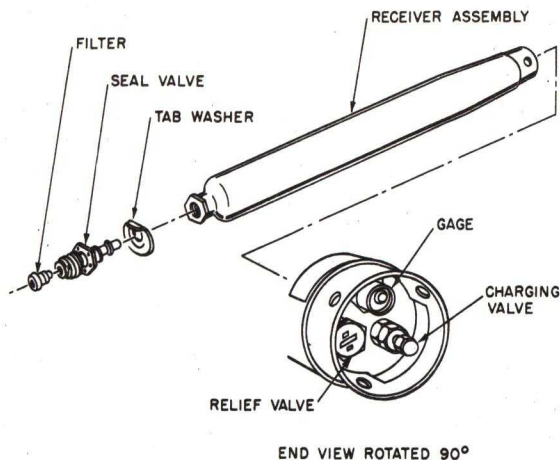


Figure 2-8. Gas Receiver (Coolant Tank).

2-7.3.1 Snubbers. Two sets of snubbers in the launcher prevent relative movement of the missile in the launcher during captive flight. One set, located in the mechanism assembly, bears against the forward missile hanger; the other, located in the housing assembly, bears against the aft missile hanger. The forward snubbers (part of the mechanism assembly) are located on each side of the detent. Each is held in the snubbing (wedging) position by a coil torsion spring. The aft snubbers (located on the underside of the launcher just forward of the aft fairing door) are similar to a pair of scissors with blunted tips pointed forward. When the aft fairing handle is closed, the snubbers spread apart and wedge against the aft hanger.

2-7.3.2 Detent. The detent is located in the center of the mechanism assembly. By straddling the forward missile hanger, it prevents longitudinal missile movement during captive flight. The detent also supports the two electrical striker points.

2-7.3.3 Safety Switches. There are two single-pole, double-throw, electrical safety switches, each with its

individual actuator. These switches are wired to the normally open terminals and are closed by the detent solenoid through a mechanical linkage. In the closed position, one switch completes the circuit between the power supply and the aft striker point for firing the missile motor. The other switch completes the circuit between the power supply and the forward striker point and is used to energize the TDD of the AIM-9B (Sidewinder 1A) missile.

2-7.3.4 Detent-Solenoid. The detent-solenoid is connected to a spring-loaded mechanical linkage. The solenoid is energized by turning on the master armament switch in the cockpit and, through the solenoid linkage, it moves the detent-lock sear down. This leaves only the detent leaf spring to hold the detent down. When the master armament switch is off and the solenoid is de-energized, the detent is locked down and will retain the missile during arrested or barrier landings. The detent-lock mechanism, when energized, also closes the two safety switches, completing their respective circuits. To prevent inadvertent firing on the ground, a safety pin is inserted in the launcher to prevent the safety switches from closing.

2-7.3.5 Power Supply. The power supply provides electrical power for the missile during captive flight as well as power for missile firings. Two separate power supplies are available, the PP2315/A and the PP2581. The PP2581 operates on 115-volt 400-cps single-phase AC and 28-volt DC from the aircraft and can only be used with the AIM-9B and AIM-9D missiles. The PP2315/A operates on 115-volt 400-cps 1- or 3-phase AC and 28-volt DC from the aircraft. The PP2315/A can be used

with the AIM-9B, AIM-9C, or AIM-9D missiles. The power supply furnishes the missile with B+, heater, filament, and firing power. An audio amplifier amplifies the missile signal and sends it to the aircraft inter-communication system to drive the pilot's earphones. The audible signal indicates missile operation before firing. A relay circuit in the power supply completes the firing circuit to the propulsion section and remains energized until the missile leaves the launcher or the master armament switch is turned off. This circuit eliminates the need for the pilot to hold the trigger depressed until the missile leaves the launcher.

2-7.4 ELECTRICAL HARNESS. The electrical-wiring harness consists of connectors and appropriate wiring from the aircraft-pylon connector on the top side of the launcher to the power supply, striker points, safety switches, detent-solenoid, and control-valve solenoid. The gas-system supply tube is routed through the electrical-wiring harness from the control valve to the power supply.

2-8 PASSIVE FILTRATION AND CHARGING UNIT

The passive filtration and charging unit takes either air or nitrogen at approximately 3000 psig and filters it to remove contaminants. Figures 2-9 and 2-10 show the Models 1012A and 1012B. Model 1012A does not have an air compressor and is intended for shipboard use or other installations which have sources of high-pressure air or nitrogen. Figure 2-11 is a flow diagram of the unit.

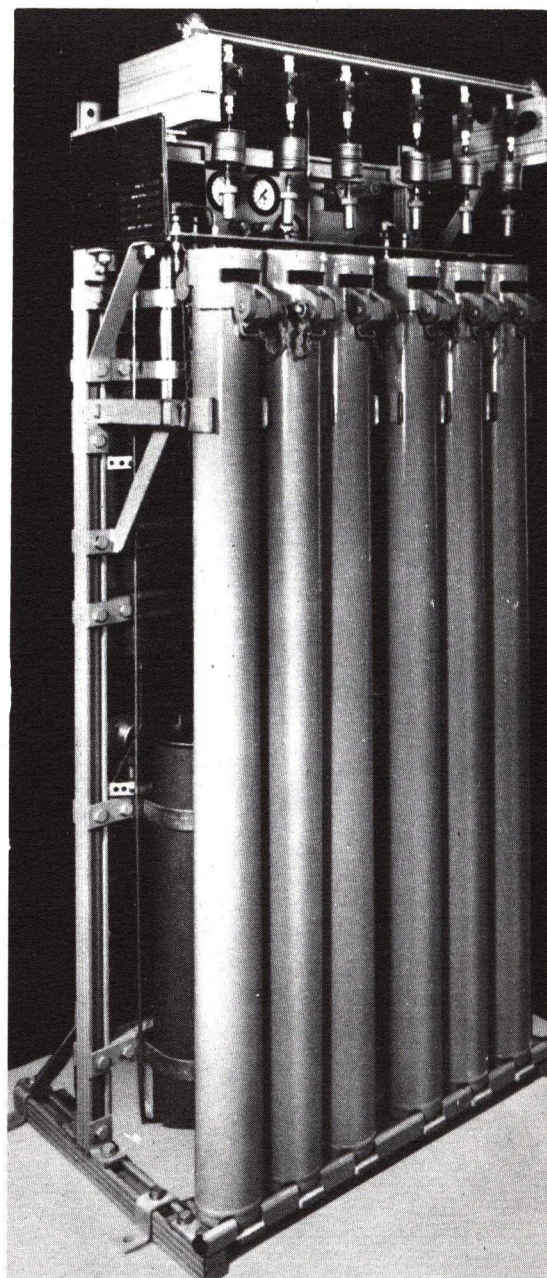


Figure 2-9. Passive Filtration and Charging Unit Model 1012A.

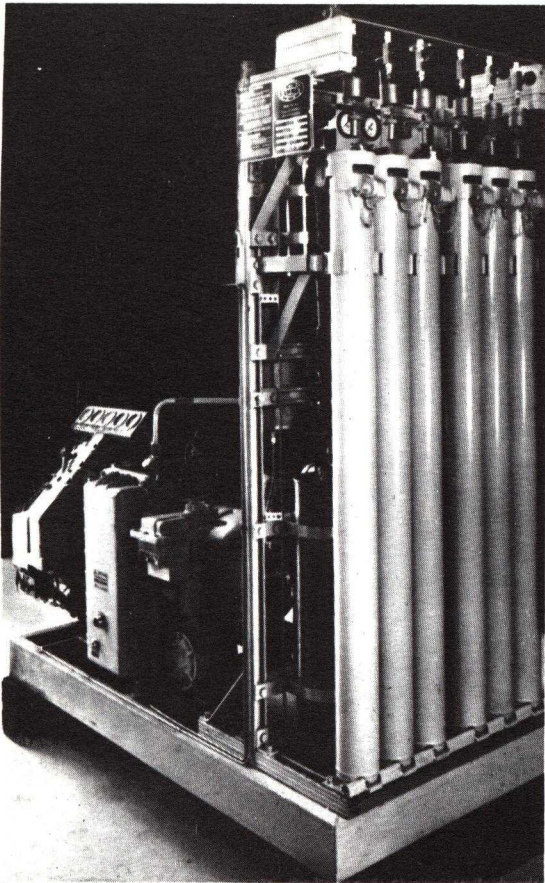


Figure 2-10. Passive Filtration and Charging Unit Model 1012B.

Throw-away molecular-sieve cartridges and blowdowns on the accumulator and mechanical filters remove the contaminants. When the cryostat monitor in the filtration unit indicates that the contaminants in the gas have exceeded an acceptable level, the unit automatically shuts down, and filter changes are required. The

filling rate is approximately six coolant tanks (bottles) in 20 minutes.

Instructions for filling and charging the tanks are given in NAVWEPS 19-25D-20 (Latest Revision).

2-9 TRAINING COMPONENTS

There are three types of dummy missiles used as training components. The type numbers are stenciled on the various missile components.

2-9.1 TYPE I. This missile has inert components. The servo has dummy pistons and no gas-generator grain. It is used in the evaluation of aircraft performance, aircraft-missile compatibility, and missile structure and is used in handling practice.

2-9.2 TYPE II. This missile has a live motor, a dummy warhead and fuze, and a dummy GCG with a pressurized servo. It is used to duplicate the first 0.5 second of missile flight in tests of missile separation from the launcher.

2-9.3 TYPE III. This missile has a live GCG with a special "servo-saver adapter" that allows captive flights in which the pilot can listen to the missile signal, but cannot ignite the servo grain. The remainder of this missile consists of dummy components. It is used in pilot training and acquisition-system compatibility of the aircraft and missile.

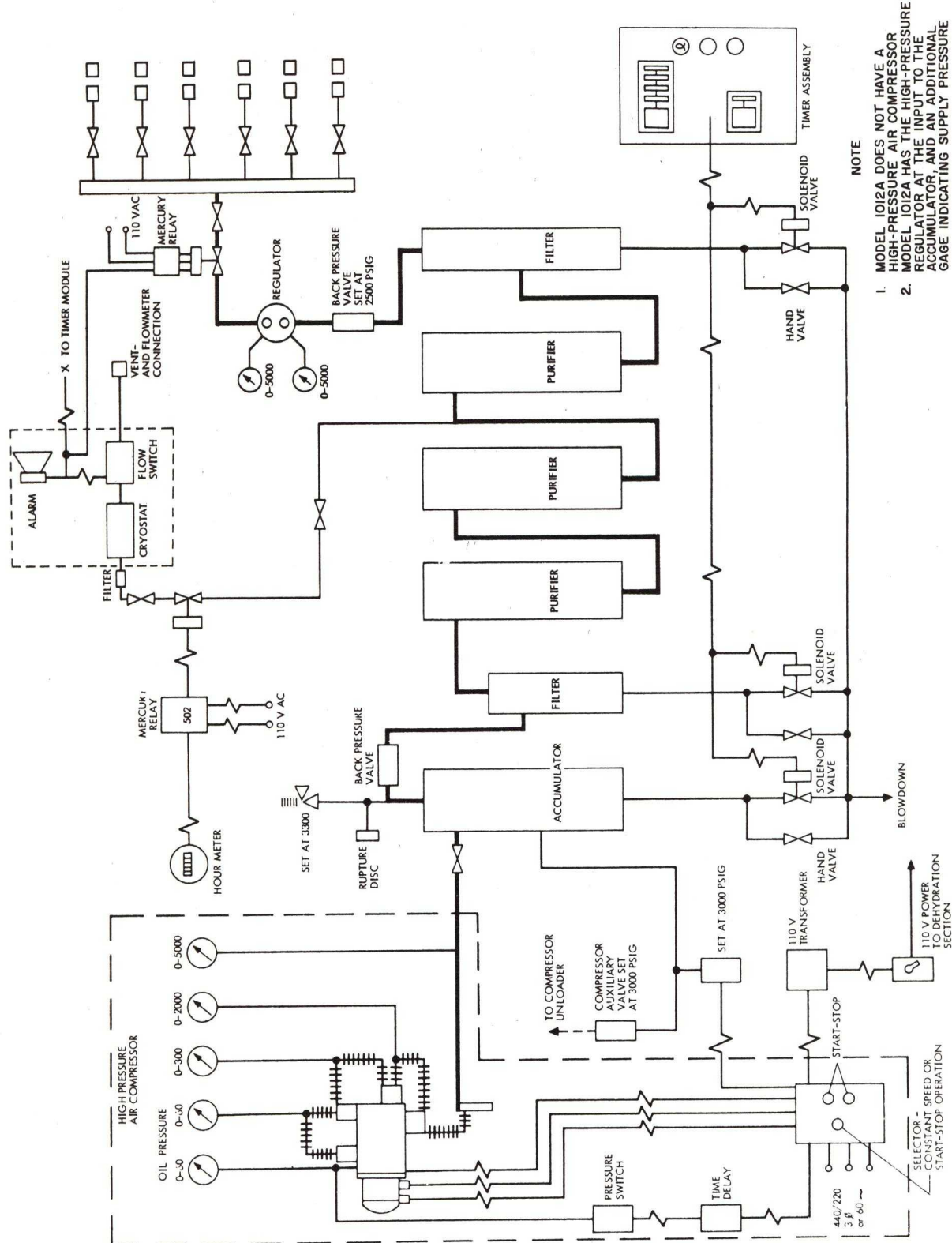


Figure 2-11. Passive Filtration and Charging Unit, Flow Diagram.

Chapter 3

FUNCTIONAL DESCRIPTION

The AIM-9D is a supersonic, air-to-air, guided missile that homes on infrared radiation from the target, flies a proportional-navigation intercept course, and detonates its warhead upon colliding with or passing near the target.

The missile has the ability to home head-on as well as tail-on, on enemy aircraft flying in the Mach 2 region at altitudes up to 80,000 feet. The nose-on capability is restricted to targets operating with afterburner and to firing positions within 20 degrees of dead ahead.

3-1 PROPORTIONAL NAVIGATION

Figure 3-1 shows the basic principles of proportional navigation, the method of navigation employed by the AIM-9D in maintaining its intercept course to the target. As illustrated in figure 3-1, the AIM-9D is launched behind and to the right of the target path and travels at twice the speed of the target. If the target continues in the same direction and at the same speed, the line of sight remains constant in space and the missile intercepts the target at point A. Should the target take evasive action, the line of sight will rotate in space and the missile will turn in the same direction at a rate proportional to the rotation of the line of sight. The missile will turn until the line of sight rotation stops. At this time the missile course is again correct to intercept the target at point B.

The ratio of the turning rate of the airframe to the turning rate of the line of sight is called the navigation constant (N). This means that the turning rate of the missile is N times the line-of-sight turning rate.

3-2 GUIDANCE AND CONTROL GROUP

The components of the Mk 18 Mod 2 GCG function in such a manner as to sense target-to-background radiation contrasts, generate electrical target position signals from information contained in these contrasts, and develop guidance signals from these generated electrical signals.

The conversion of radiation contrasts to electrical signals is accomplished by a rotating gyro-optical system. The gyro-optical system collects infrared (IR) radiation from the target, modulates the IR energy, and focuses it on a photoconductive cell. From the modulated output voltage of the photoconductive cell, information defining target position in polar coordinates is extracted and sent as a command voltage to the guidance section.

The guidance section exerts a force on the gyro-optical system, bringing the optical axis in coincidence with the line of sight to the target.

The signal from the guidance section is converted to Cartesian coordinates in the control section and is

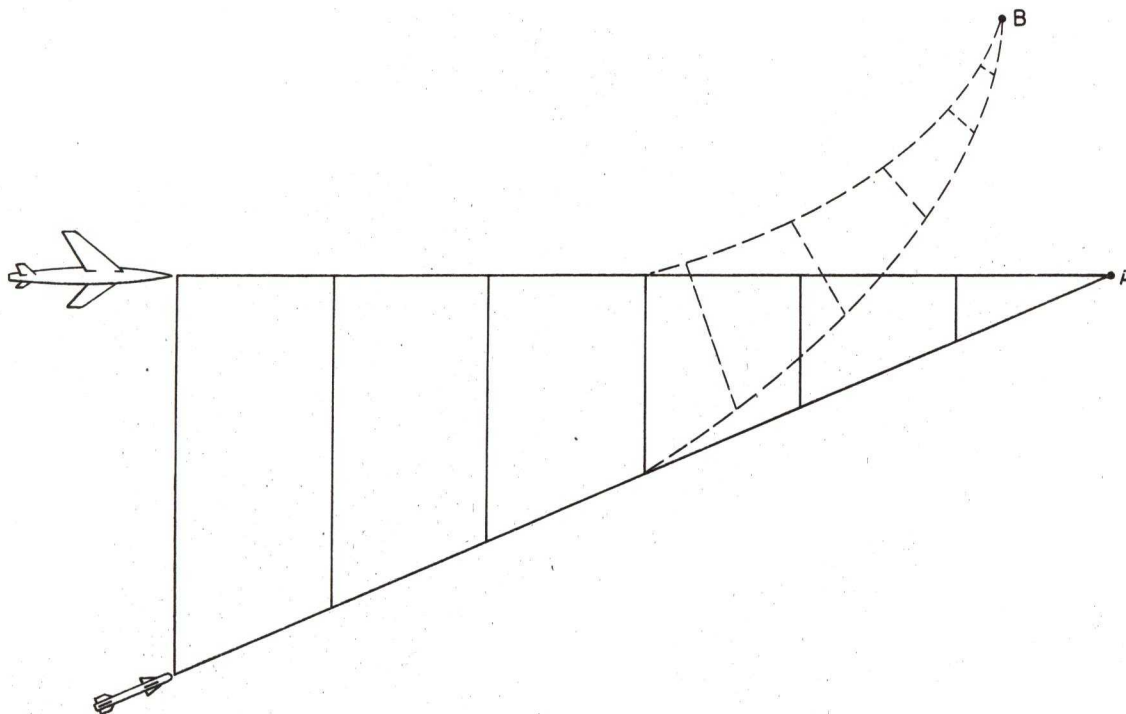


Figure 3-1. Principles of Proportional Navigation.

applied to the control servo to actuate the control fins and maneuver the missile in the direction of the change of line of sight and at a proportional rate.

3-2.1 SEEKER. The optical system of the seeker is shown in figure 3-2. The seeker section of the GCG is composed of the following components: gyro motor rotor, head coils, nose dome, telescope, and RDU.

The nose dome is constructed of magnesium fluoride and is geometrically spherical. The primary function of the dome is to serve as a transparent nose window to admit IR energy to the telescope. A secondary function of the dome is to partially correct a defect known as spherical aberration. This aberration is a result of using a spherical rather than a parabolic mirror in the telescope.

The gyro-optical portion of the seeker is composed of a modified Cassegrainian telescope with a one piece primary mirror magnet.

The gyro (magnet and telescope) is mounted on a three-axes gimbal with the ability to precess 40 degrees in any direction from the missile longitudinal axis.

Infrared radiation from a 2.5-degree solid angle is focused by the optics upon a reticle that rotates with the gyroscope, figure 3-3. The infrared energy from a target is focused on the reticle and then collected by the optical system of the detector assembly or RDU. As the gyroscope rotates, the opaque and transparent spokes of the reticle alternately block and transmit target energy so that modulated energy impinges upon the detector. The 180-degree sector of the reticle pattern having 50 percent

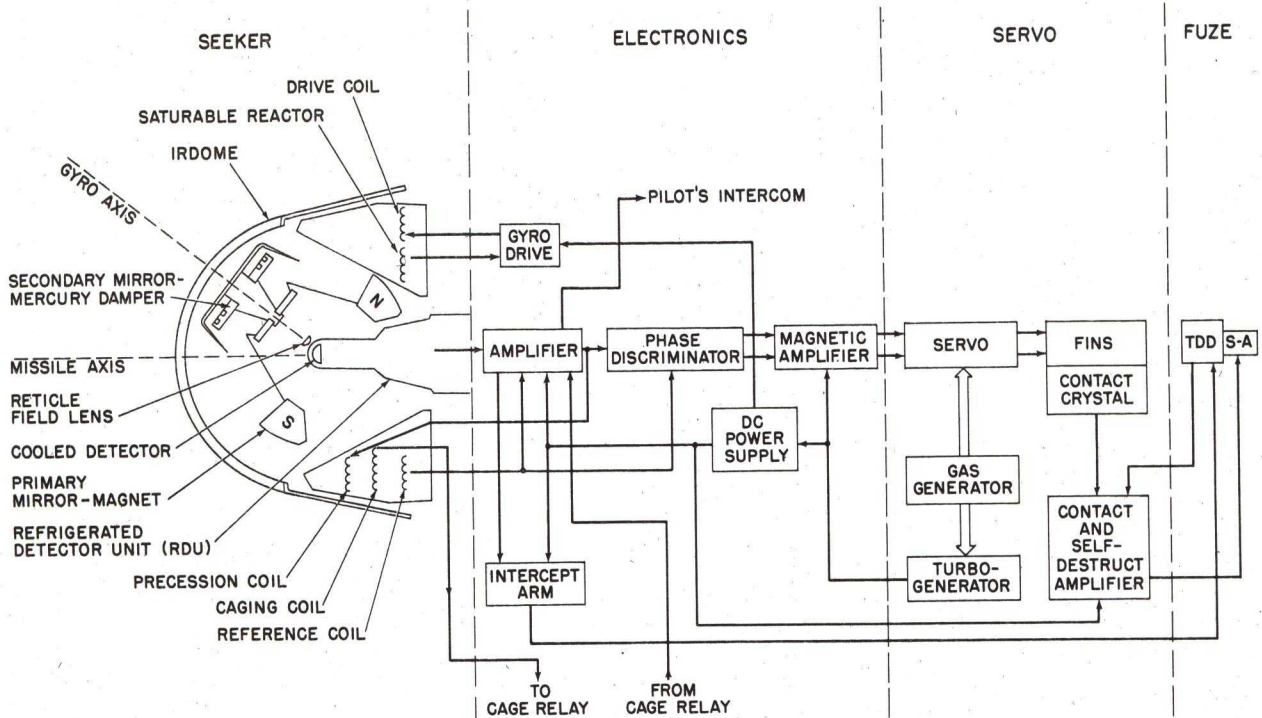


Figure 3-2. Block Diagram of the Mk 18 Mod 2 GCG.

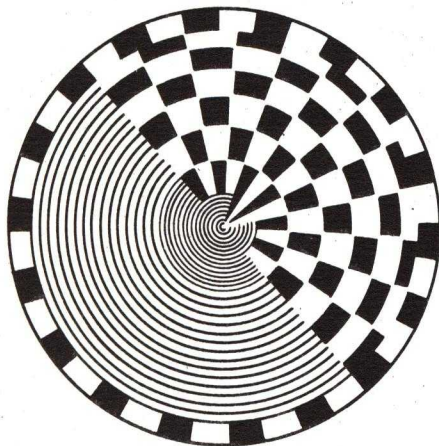


Figure 3-3. Reticle Pattern.

transmission provides phase information that is used by the electronics to determine the angular position of the target with respect to the optical axis of the gyroscope. The checkered pattern of the target sensing sector of

the reticle is designed to reduce the effect of signals obtained from background radiation such as clouds. An interference filter is placed in front of the reticle to restrict the spectral range of the energy that reaches the detector, thereby reducing the level of seeker noise caused by the presence of clouds and terrain within the missile field of view. The pattern on the periphery of the reticle produces a signal as the missile approaches intercept with the target. This signal is called intercept-arm and is supplied to the influence fuze to initiate arming. This prevents the fuze from arming prematurely on noise spikes or other spurious signals.

The RDU contains the infrared detector. It is cooled to the temperature of liquid nitrogen by the Joule-Thomson cooler, which operates from

the expansion of high-pressure gas (either air or nitrogen) from the coolant tank in the launcher. The detector is cooled to increase its sensitivity to the longer wavelength portion of the spectrum, to increase its sensitivity, and to protect it from high-temperature aerodynamic heating. The infrared detector converts the modulated infrared energy impinging upon it into electrical signals that are amplified and processed by the electronics. The RDU is fixed and in position so that the cooled detector is optically at the center of the precession of the gyro. This minimizes the degradation in seeker sensitivity as the gyro precesses to large gimbal angles.

The gyro is positioned with a conical head-coil assembly. The coil assembly is conical so that the gyro can precess throughout its 80 degrees of gimbal freedom with only negligible vignetting of the seeker field of view at the extreme gimbal angles. An exploded view of the head-coil assembly is shown in figure 3-4. This assembly is physically a part of the seeker.

The gyro drive circuit provides current to each of four gyro drive coils in turn so that the gyro rotates in a clockwise direction, looking from the front, at a speed of 7500 revolutions per minute. A regulation circuit, by controlling the amplitude and direction of the current in the gyro drive coils, controls the rotational speed of the gyro during both captive and free flight. Through different circuitry, instantaneous gyro-position information is provided by four reference coils to the electronics. This information, coupled with the phase of the modulated signal from the infrared detector, is used by the electronics to determine the angular position of the target with respect to the missile coordinates.

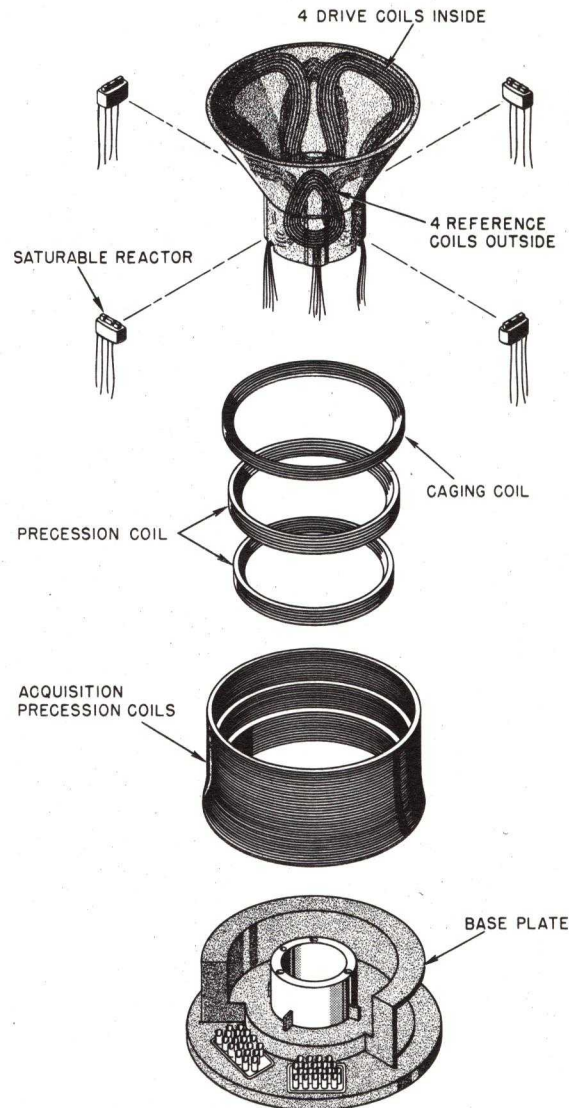


Figure 3-4. Head-Coil Assembly.

Gyro precession forces are exerted on the permanent magnet of the gyro by current flow through the head-coil precession coil. Before missile launching, the gyro is electrically caged to the longitudinal axis of the missile by forces exerted through the precession coils. Gyro position is obtained from the caging coil.

3-2.2 ELECTRONICS. The modulated signal from the RDU is processed

CONFIDENTIAL

FUNCTIONAL DESCRIPTION

in the electronics section. The modulated signal is amplified by the electronics and detected to obtain target information at the rotational frequency of the gyro. The undetected signal is sent to the pilot's intercom system as an audible indication of the presence of a target. The detected signal is filtered by a narrow-band synchronous filter that is synchronized by the electrical signals from the reference coils. After being filtered to remove noise, the signal is again amplified. The amplified signal is then applied to the precession coils. The current flowing in the precession coils creates a magnetic field, the phase of which is related, in time, to the position of the rotating magnet in such a way as to cause the gyro to precess toward the target. As a result, the target image tends to remain in the center of the reticle, and the amplitude of the signal generated is proportional to the angular rate of the line of sight between the gyro optical axis and the target. The detected and amplified signal contains phase and amplitude information that is proportional to the direction of rotation and rate of rotation of the line of sight to the target with reference to the missile coordinates. This signal is compared in a phase detector with signals from the reference coils that define, electrically, the missile coordinates.

The phase detector has two outputs. One output is a current proportional to the signal in the up-down plane and the other output is proportional to the signal in the left-right plane. The direction of the current flow determines whether phase detector output is right or left, up or down. These two output currents are sent to a two-channel magnetic amplifier that controls the servo torque acting on the canard control surfaces.

Because of the length of the control time (60 seconds), it is necessary to supply enough energy to keep the gyro optics spinning at a constant speed throughout flight. The gyro drive circuitry receives its power from the DC power supply and transmits it to four drive coils in the head-coil assembly. Four saturable reactors in the head-coil assembly determine the timing of the application of power to the drive coils, and a regulator circuit controls the amplitude to maintain a speed of 125 cycles per second.

The warhead is detonated by one of three methods: (1) upon impact with the target, the contact fuze (the sensing element of which is a piezoelectric crystal in the fin rocker arm) produces an electrical signal, which causes the S-A to detonate the warhead with no time delay; (2) if the missile passes within a predetermined distance of the target, the outer ring on the reticle creates the signal that "arms" the fuze, and the fuze then controls the detonation of the warhead to destroy the target; and (3) in case neither of the above occurs, the decay of internal power (approximately 60 seconds) within the GCG causes a signal to go to the S-A, which detonates the warhead, to self-destruct the missile.

3-2.3 SERVO. The servo consists of four pistons, two pairs of orthogonal fins, a gas generator, and a turbo-generator. The output signals from the magnetic amplifiers control two sets of push-pull solenoids, which, in turn, control the piston valves. These valves control the differential pressure in the piston chambers. When the piston pressures are unbalanced, the pistons exert torque on the rocker arm on which a pair of fins is rigidly mounted. For example, if an "up"

CONFIDENTIAL

command is given, the current in the right-left solenoids remains normal, the current in the up solenoid increases, and the current in the down solenoid decreases. Consequently, pressure on the up chamber increases and pressure on the down chamber decreases, simultaneously driving the up piston out and allowing the down piston to retract, turning the fins until the aerodynamic forces on their surfaces create a torque that equals the commanded torque.

An end-burning propellant grain in the gas generator is used to supply high-pressure gas for the operation of the servo and also to drive a small turbogenerator that supplies electrical power to the GCG during flight. There are no batteries in the AIM-9D. The gas generator provides high pressure gas for a nominal 60 seconds.

3-3 FUZES

The primary function of the TDD of the fuze is to sense the target and cause warhead detonation at the point of maximum kill probability. When the missile passes within a predetermined distance of the target, the TDD sends a firing signal to the explosive train in the S-A, causing initiation of the warhead booster and detonation of the warhead. In case of contact with the target, a signal from a piezoelectric crystal in the rocker arm of the servo initiates the explosive train in the S-A. If the missile passes out of range of the target, a self-destruct feature in the GCG detonates the warhead through the firing circuit of the S-A after the burnout of the gas-generator grain.

The TDD operates from its integral power supply, which is a reserve-type energizer, and is completely independent of the power supply of the missile. The Thermal Battery Mk 70 is sealed in the TDD during manufacture. Just before missile launching,

an electrical pulse is supplied to the missile GCG by the launching aircraft through the umbilical connector. When the turboalternator of the GCG comes up to operating condition, the firing relay in the launcher power supply closes, applying firing current to the Mk 36 motor and the squib of the thermal battery of the TDD.

The S-A performs the dual functions of (1) preventing detonation of the missile warhead during assembly and handling and during the first 500-1100 feet of flight of the missile, and (2) arming the warhead so that detonation takes place after the missile has traveled the specified distance. The S-A performs these functions by keeping the units of the explosive train, which it contains, in a misaligned condition until the missile has reached a safe distance from the aircraft, and then bringing them into alignment. The sequence of events that controls the action of the S-A is as follows:

1. An electrical signal received from the launching aircraft actuates the solenoid launch-latch, unlocking the mechanism.

2. The S-A senses missile acceleration during the boost phase of flight and, if sufficient acceleration has been maintained, will advance to "commit-to-arm" position (400 to 500 feet from the launching aircraft). If the missile motor malfunctions and burnout occurs before the missile attains the minimum missile-to-aircraft separation distance of 400 feet, the S-A will not reach the "commit-to-arm" position, but will return to the SAFE position.

3. If missile acceleration is normal, the S-A will attain the "commit-to-arm" position, and arming will be completed during deceleration.

4. On target intercept, an electrical signal from the TDD firing circuit initiates the explosive train leading to the warhead booster, which detonates the warhead.

3-4 WARHEAD

Upon detonation, the Mk 48 warhead explodes into a ring of steel that expands to a maximum of 34 feet in diameter at a rod velocity of 4000 feet per second. Since the 3/16-inch-square rods receive as much energy from the explosive charge at high altitude as they receive at low, and do not rely for effectiveness on blast, the deadliness of the AIM-9D warhead is equal at all altitudes. Even at its maximum expansion, the steel ring can knife through the skin and skeletal members of the toughest aircraft structures. The capacity of the high explosive to withstand temperatures of 300°F makes it safe for adverse storage conditions and for carrying it aboard high-performance aircraft.

3-5 MOTOR

In a time span of 1 second, the AIM-9D propulsion unit, the Mk 36 motor, functions as follows: (1) The pilot presses the trigger, which fires the gas-generator grain in the GCG. (2) The gas-generator grain ignites, supplying hot gas to drive the turboalternator. (3) The turboalternator turbine reaches a speed of 5300 cycles per second which generates a voltage across a load resistor in parallel with a tuned relay in the launcher. (4) The tuned relay in the launcher closes and supplies a 5-amp firing pulse to the aft contact button on the motor, which is connected to the Mk 5 squib. (5) The squib ignites the booster charge, which ignites the igniter grain. (6) The igniter grain ignites the propellant grain. (7) The

motor chamber is pressurized, which bursts the weather seal. (8) The burning gases are expanded through the nozzle with a resultant increase in gas velocity, which propels the missile forward.

3-6 AIRCRAFT LAUNCHING SYSTEM

The pilot's job in launching the AIM-9D missile is essentially limited to pointing the aircraft so that the missile can see the target and then squeezing the trigger when the target is within range of the missile. The pilot's handbook (OP 3353) gives more details on aircraft launching.

3-7 LAUNCHING EQUIPMENT

The LAU-7/A launcher secures the missile during captive flight and releases it when it is fired by the pilot. It supplies the electrical power for the missile and the high-pressure gas required in the operation of the infrared seeker of the AIM-9D.

3-7.1 MISSILE SUPPORT. The LAU-7/A launcher supports the three missile hangers within a rail or track. The detent prevents forward or aft movement of the missile in flight until the missile is fired. The snubbers prevent other movement between the launcher and the missile. The umbilical support restrains the umbilical block, which separates from the missile as the missile is launched.

3-7.2 GAS SYSTEM. When the cooling switch in the cockpit is placed in the ON position, the control valve opens and allows gas to flow from the coolant tank to the missile. Placing the switch in the OFF position shuts off the gas. A simplified block diagram of the gas system is shown in figure 3-5.

3-7.3 ELECTRICAL SYSTEM. The LAU-7/A launcher contains electrical

power supplies, through which power is supplied to the missiles before firing, to the striker points for firing the missiles, to the gas control valve, and to the detent solenoid, through which the amplified missile signal is de-

livered to the pilot. Safety switches, operated by the detent solenoid, prevent delivery of power to the striker points when the MASTER ARMAMENT switch is de-energized.

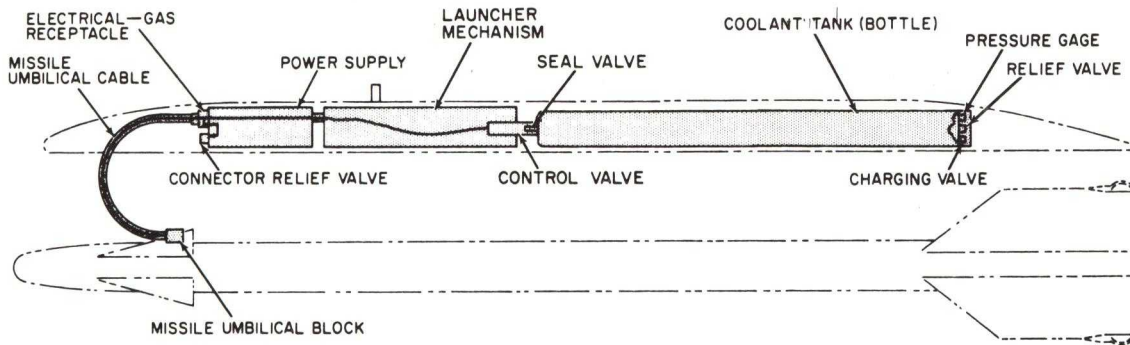


Figure 3-5. Gas System for the LAU-7/A Launcher, Block Diagram.

Chapter 4

SHIPPING, HANDLING, AND STOWAGE

This chapter gives information on shipping, handling, and stowage requirements for the AIM-9D missile components.

Logs and records of incoming and outgoing shipments should be recorded and reported in accordance with procedures established for the AIM-9D missile system.

4-1 SHIPPING CONTAINERS

The identification, dimensions, and weights of containers, as well as figure numbers that illustrate these containers, are given in table 4-1. Additional information is presented in the following paragraphs.

4-1.1 GUIDANCE AND CONTROL GROUP CONTAINER. Two Guidance and Control Group Mk 18 with TDD Mk 244 attached are shipped in Container Mk 241 Mod 1, figure 4-1. The body of the container is yellow and has a yellow band painted on the gray lid. The polyurethane support-tube inserts and plastic extractors are also yellow as part of the color code for the AIM-9D missile.

4-1.2 FIN CONTAINER. Quick-attach canard fins for the AIM-9D GCG Mk 18 are packed in a standard Mk 387 Mod 0 aluminum shipping and stowage container, which has a special polyethylene plastic tray for in-

Table 4-1. Containers for AIM-9D Missile Components

Identification	No. Units	Dimensions, in.			Weight, lb			Figure No.
		Length	Width	Height	Empty	Container and Dunnage	Cont., Dunnage, and Component(s)	
GCG Container Mk 241 Mod 1	2	39.25	17.25	17.25	44	67	140	4-1
Fin shipping and stowage cont.	12	15.38	12.9	6.6	8	9	15	4-2
TDD Outer Container Mk 129 Mod 0	4	29.03	11.22	11.87	31	35.5	69.5	4-3
S-A Inner Container Mk 127 Mod 0	4	10.38	9.38	2.79	2	3	8	4-4
S-A Outer Container Mk 2 Mod 0	20	15.36	12.35	14.55	21	22	62.5	4-5
Warhead Container Mk 386 Mod 0	2	15.38	12.9	6.6	8.5	.....	58.5	4-6
Motor Container Mk 287 Mod 0	1	73.56	8.23	6.75	30	.....	129	4-7
Wing Assembly Cont. Mk 418 Mod 0...	8	32.5	23.5	17.422	.....	.....	120	(not avail.)

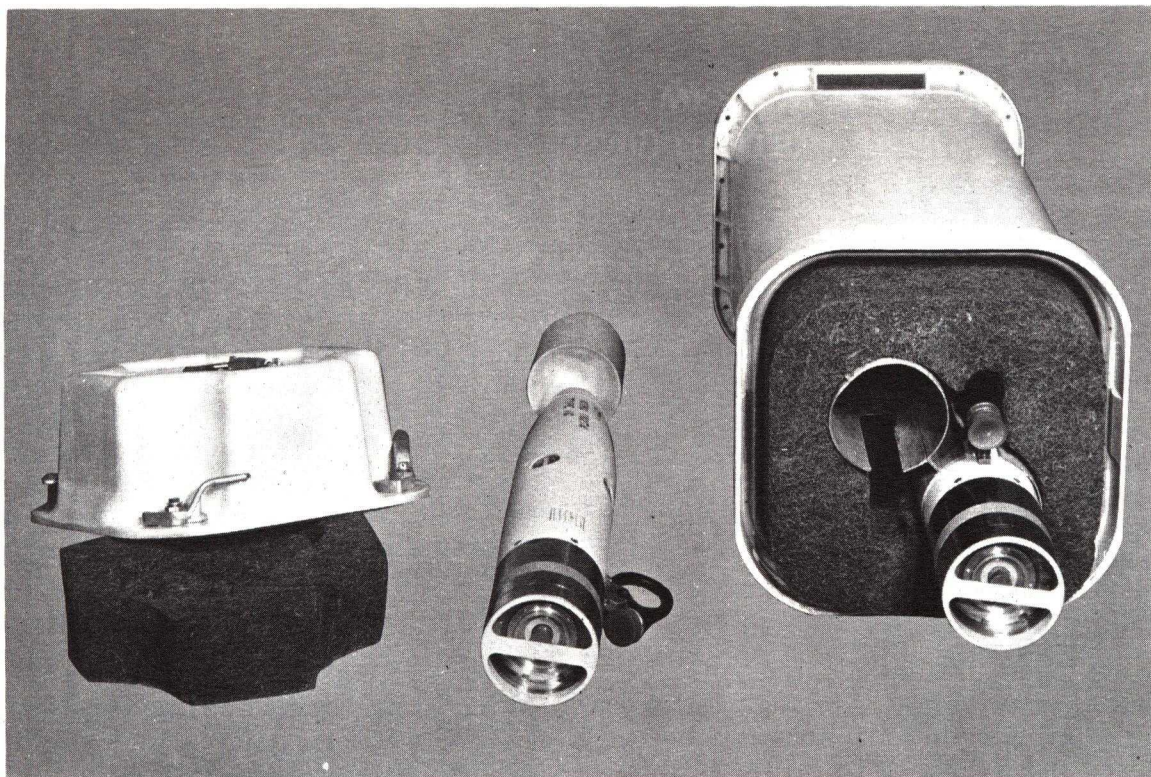


Figure 4-1. Mk 241 Mod 1 Container for Mk 18 GCG.

ternal dunnage. No special mark or mod assignments have been made for this container in the AIM-9D system. Figure 4-2 shows the container with 12 fins.



Figure 4-2. Fin Container.

4-1.3 TDD AND S-A CONTAINERS. The TDD and the S-A of the fuze are shipped separately. Each component is hermetically sealed by the manufacturer and should not be removed from its container until it is needed for assembly.

4-1.3.1 TDD Container. The TDDs are shipped in two different ways. The IR TDD is attached to the Mk 18 GCG and is shipped from the depot in the GCG Container Mk 241 Mod 1. The RF TDDs are shipped from the depot in the Mk 129 container, figure 4-3. However, IR TDDs may be shipped from the depot to the Fleet in the Mk 129 container.

NOTE: Do not place IR TDDs in a container that was used to ship RF TDDs or vice versa.

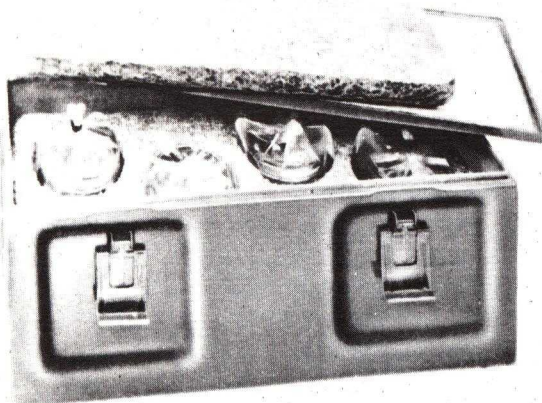


Figure 4-3. TDDs in Outer Container.

Each TDD is sealed in an individual polyethylene bag for protection against dust and moisture and, when shipped separately from the GCG, four TDDs are placed in each outer container.

4-1.3.2 S-A Container. Four S-As, packed in vibration-absorbing and shock-absorbing material, are packed in the Inner Container Mk 127 Mod 0, figure 4-4. Normally, five inner containers are packed in each Outer Container Mk 2 Mod 0 (ammunition component box), figure 4-5.

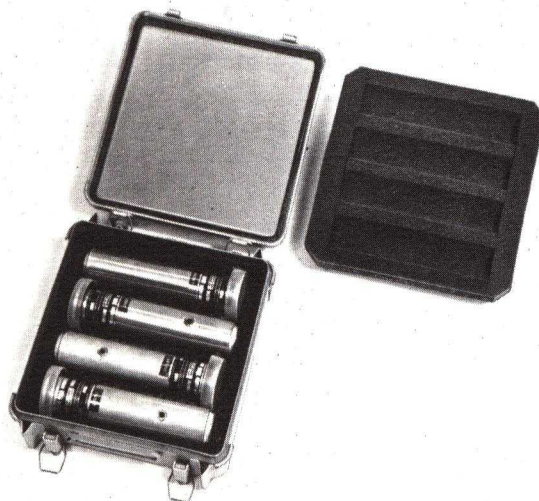


Figure 4-4. S-As in Inner Container.

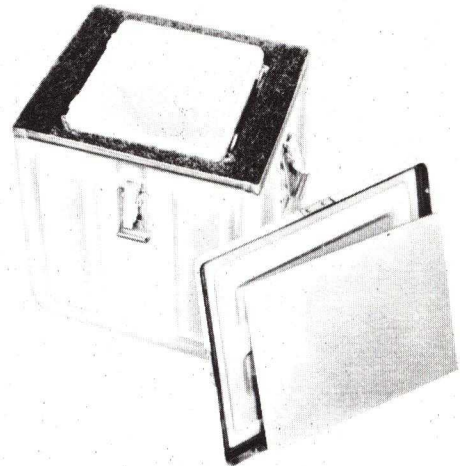


Figure 4-5. S-As in Outer Container.

4-1.4 WARHEAD CONTAINER. The aluminum Container Mk 386 Mod 0 is used to ship two warheads, figure 4-6.

4-1.5 MOTOR CONTAINER. The steel Container Mk 287 Mod 0 with motor is shown in figure 4-7.

4-1.6 WINGS WITH ROLLERONS CONTAINER. Eight wings with rollerons—the rollerons protected by plastic caps—are shipped in the Container Mk 418 Mod 0.

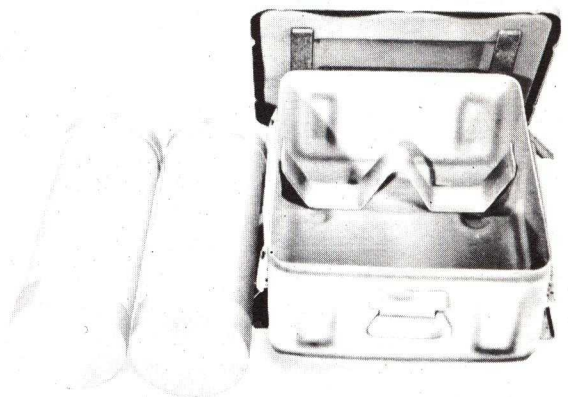


Figure 4-6. Warhead Container.

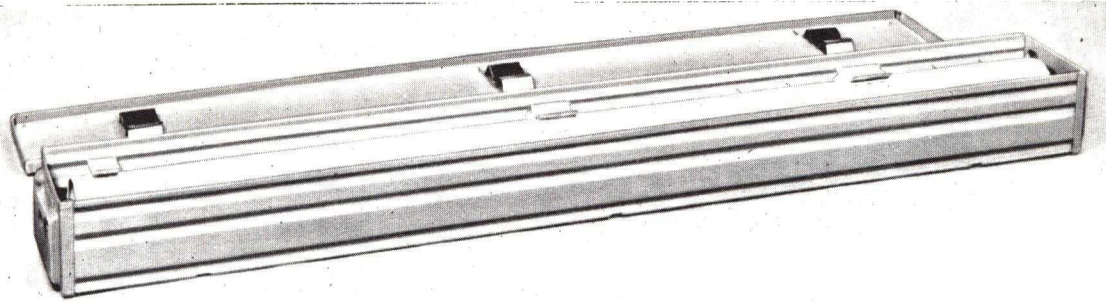


Figure 4-7. Motor Container (With Motor Ready to Ship).

4-2 ASSEMBLY EQUIPMENT AND TOOLS

A can wrench, which is provided with the tools, can be used to open the GCG container. In the assembly operation, an assembly stand, tube spanner wrench, speed wrench, torque wrench, Allen wrench, and special screwdriver are required for the AIM-9D missile. A bottle wrench is required to install the coolant tank in the launcher.

4-2.1 ASSEMBLY STAND. The Side-winder assembly stand, figure 4-8, is 46 inches long, 32 inches wide, and 35 inches high and weighs approximately 35 pounds. It can be disassembled for bulkhead storage. When disassembled and stowed, the stand occupies a space 46 inches long, 32 inches wide, and 8 inches high.

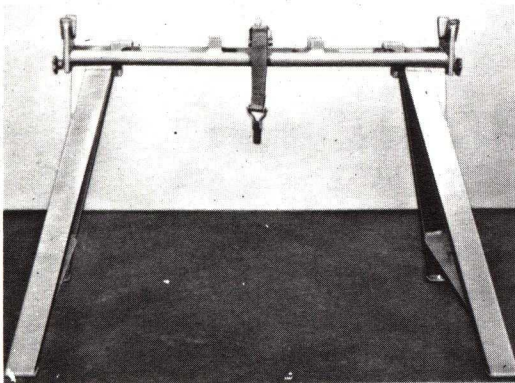


Figure 4-8. Assembly Stand.

4-2.2 DECANNING AND ASSEMBLY TOOLS. Tools for decanning the GCG, for assembling AIM-9D missile components, and for installing the coolant tank are illustrated in figure 4-9.

4-3 HANDLING EQUIPMENT

Bomb skids with adapters are used aboard ship for transporting AIM-9D missile components, including coolant tanks, and for transporting fully assembled missiles to the aircraft or to ready-service stowage compartments.

Specifically, the equipment consists of the Aero 12B bomb skid, three adapters (Aero 8C-1, 9B, and 39B), and the Aero 30A kit (vibration-isolation unit).

Upon receipt, the GCGs are hand-carried in their containers to the GCG stowage compartment; between the stowage area and assembly area, the GCGs are transported on trays. Whenever the GCG is out of its container, the protective dome cover must be over the ogive nose of the GCG.

4-3.1 AERO 12B BOMB SKID. The bomb skid is a two-wheel skid equipped with deadman brakes. It weighs approximately 160 pounds. For transporting assembled AIM-9D missiles, it is fitted with extra-length handles especially designed for this purpose. The regular handles can be

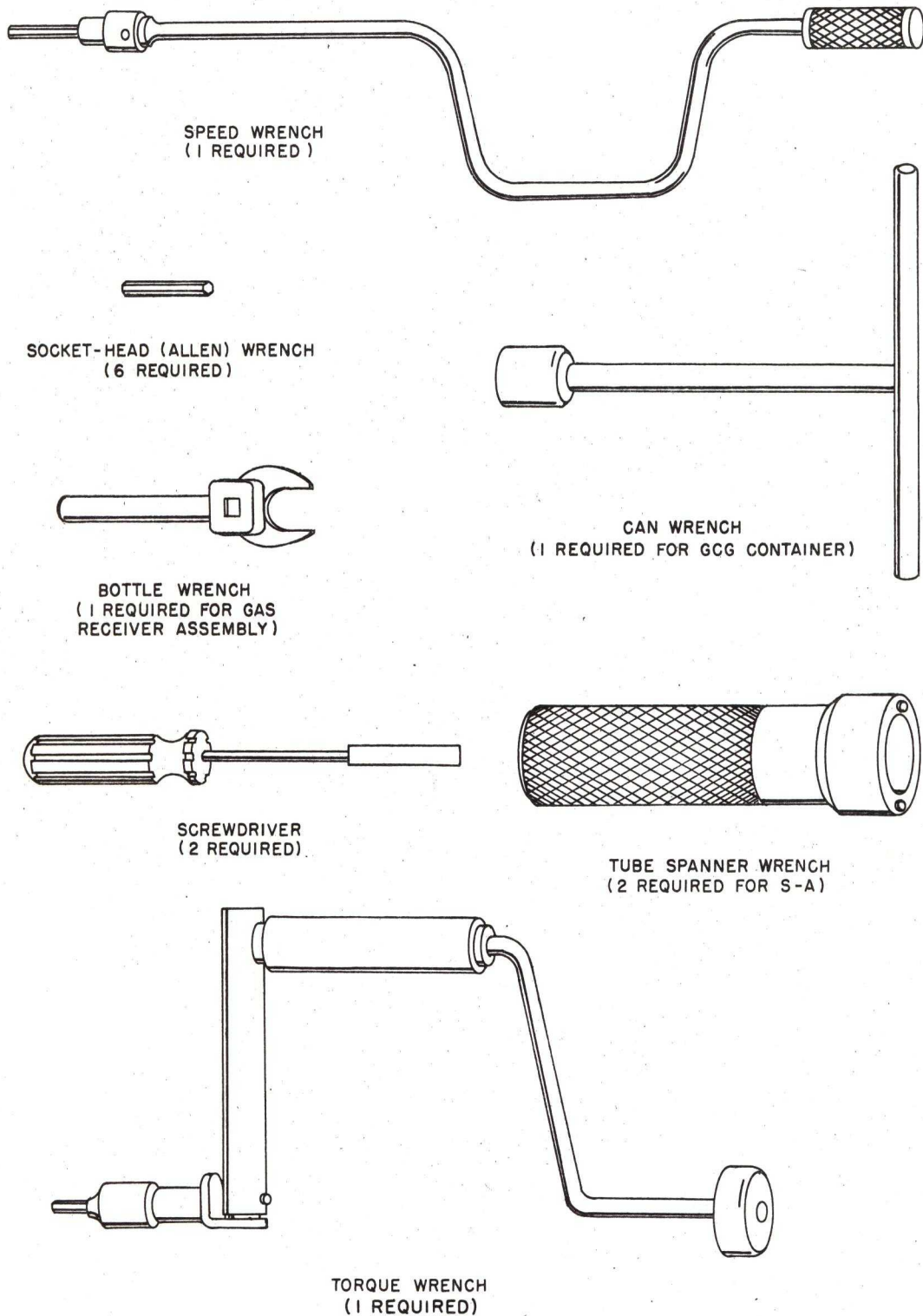


Figure 4-9. Tools Used in Decanning and Assembly.

used on the bomb skid, however, for transporting other components of the missile and the coolant tanks.

4-3.2 AERO 8C-1 ADAPTER. The Aero 8C-1 adapter is an Aero 8C that has been modified by substituting longer hanger arms for use in transporting AIM-9D missiles which have larger wings. The Aero 8C-1, figure 4-10, is used to transport Mk 36 motors from stowage to the assembly area, to transport assembled missiles from the assembly area to the ready-service stowage area, and to transport the assembled missiles to the aircraft loading area. It is used on the Aero 12B bomb skid and can hold four motors or four assembled missiles. It is also used in conjunction with the Aero 30A kit, figure 4-11, for the

stowage of four completely assembled missiles in ready-service stowage magazines. The Aero 8C-1 adapter weighs approximately 45 pounds; it is 27 inches long, 19 inches high, and 22 inches wide.

4-3.3 AERO 9B ADAPTER. The Aero 9B adapter on the Aero 12B bomb skid is used to transport warheads, TDDs, S-As, wings, and fins. In figure 4-12, the bomb skid is equipped with the Aero 9B adapter. The adapter alone weighs 23 pounds and when on the bomb skid, the total weight is 185 pounds. The box-like Aero 9B adapter is collapsible to 43 inches by 17 1/2 inches by 4 1/2 inches when not in use.

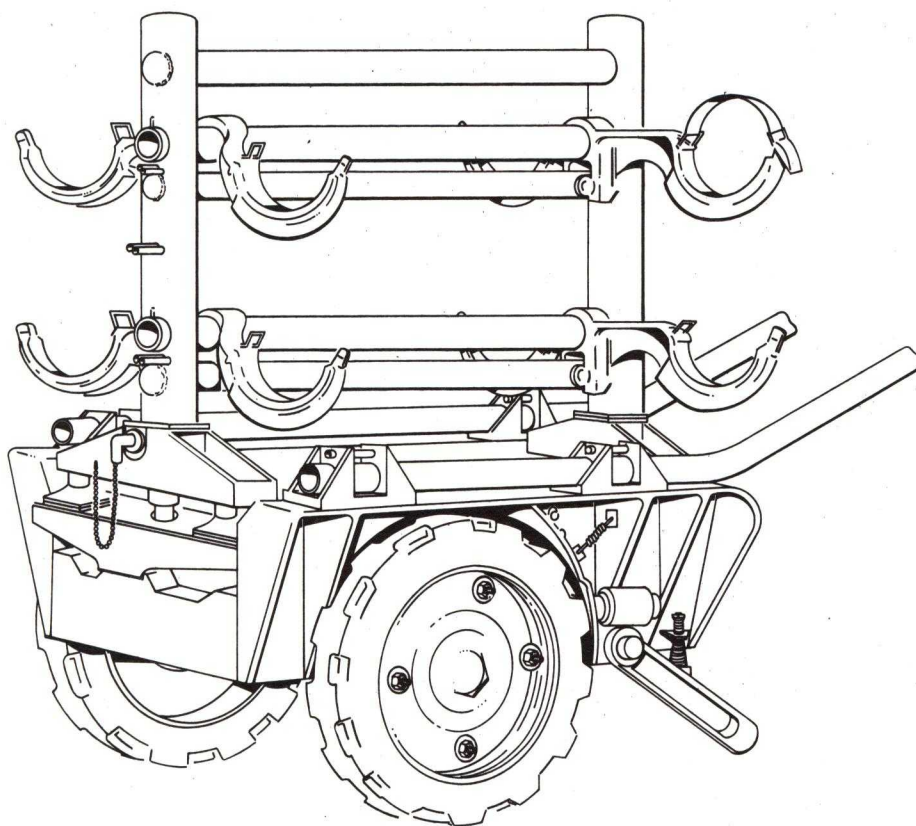


Figure 4-10. Aero 8C-1 Adapter on Aero 12B Bomb Skid.

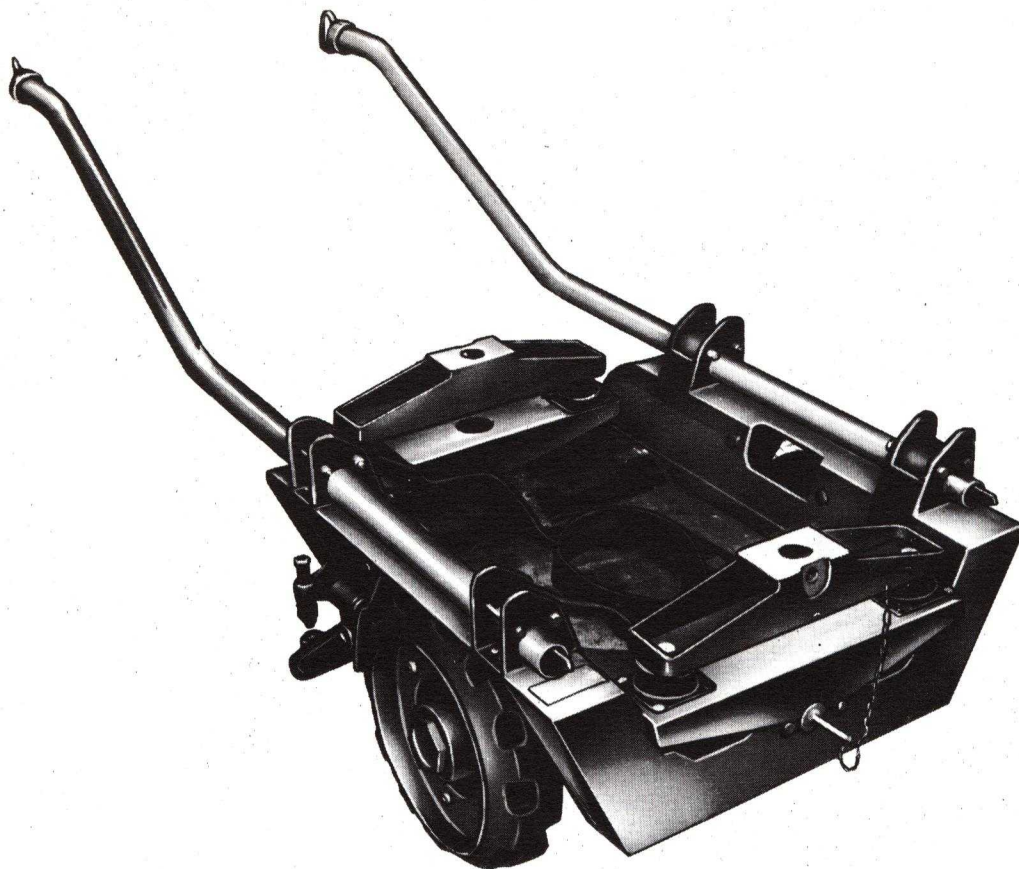


Figure 4-11. Aero 30A Kit (Vibration Isolation Unit).

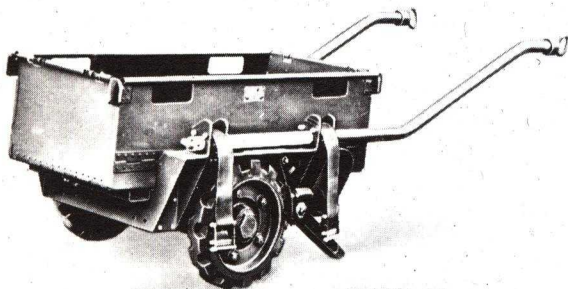


Figure 4-12. Aero 9B Adapter on Aero 12B Bomb Skid.

4-3.4 AERO 39B ADAPTER. The Aero 39B adapter is used to transport coolant tanks (bottles) through ship spaces. Each adapter can hold seven tanks, and three Aero 39B adapters can be loaded on the Aero 12B bomb skid. The adapter weighs

approximately 29 pounds and is 54 inches long, 11 7/8 inches wide, and 11 3/8 inches high. A loaded Aero 39B adapter is shown in figure 4-13.

4-3.5 TRANSPORT TRAY FOR GCG. The lightweight, aluminum tray, figure 4-14, is used to transport one GCG-fuze assembly from the stowage compartment or the dumbwaiter to the assembly area. Four trays can be placed on the dumbwaiter. The tray is 34 inches long, 5 3/4 inches wide, and 3 1/2 inches high and weighs approximately 3 pounds. Three holes in the solid, concave portion of the tray accept the fins of the GCG (the center one is for the AIM-9D GCG Mk 18; the others are for the GCG of the AIM-9C missile). The strap holds the GCG securely on the tray.

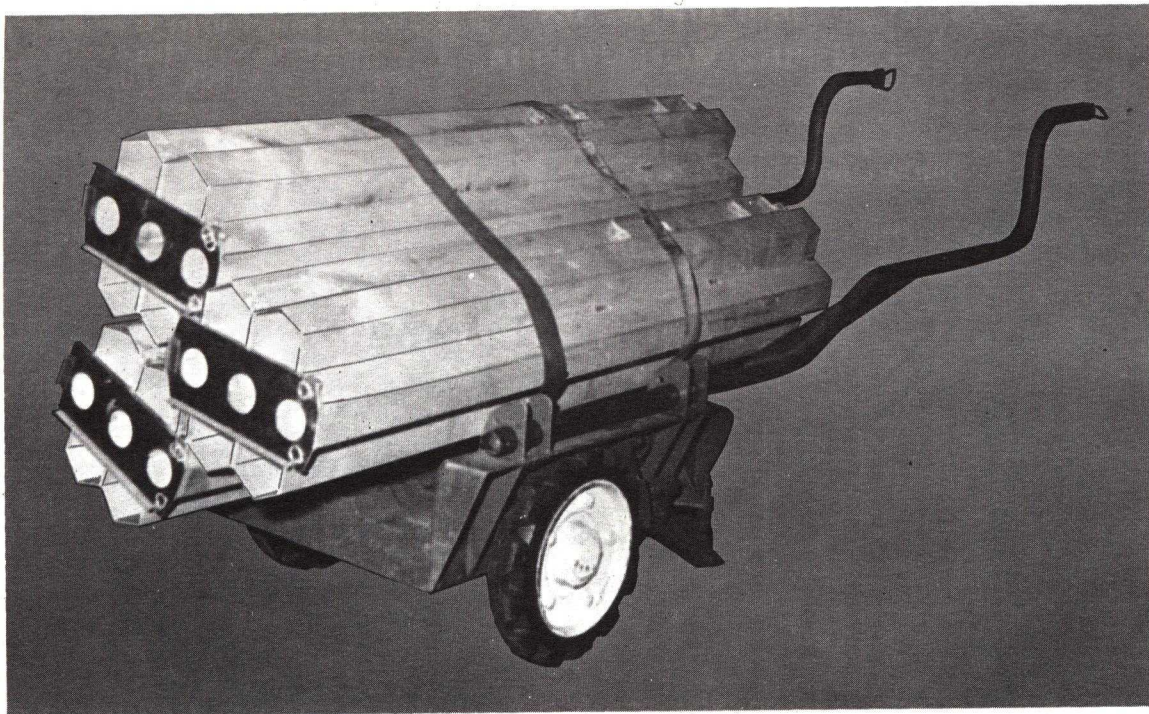


Figure 4-13. Aero 39B Adapter With Coolant Tanks.

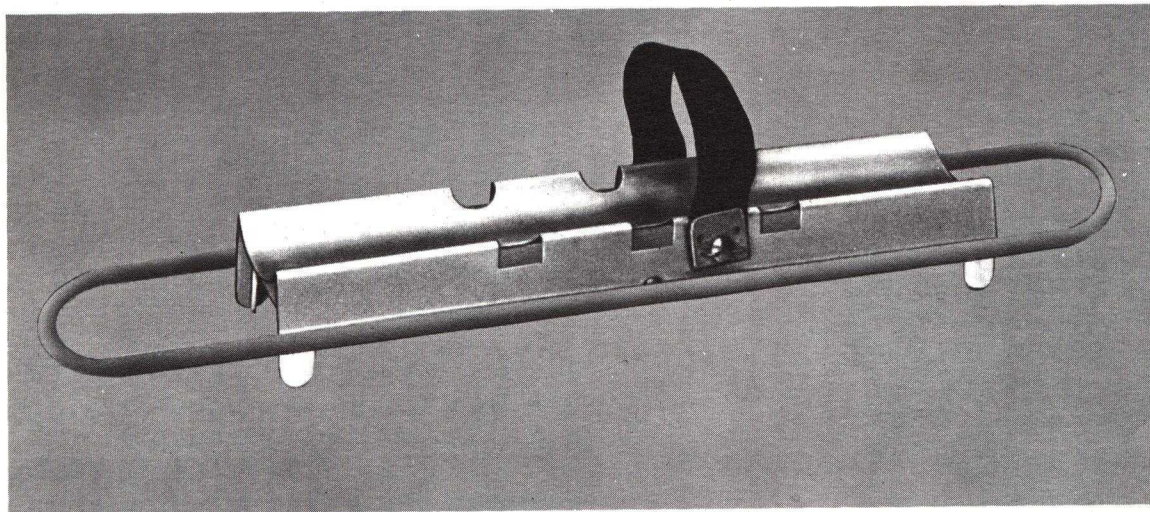


Figure 4-14. Transport Tray for GCG.

4-4 RECEIVING INSPECTION

All components of the AIM-9D missile should be inspected upon receipt. Inspect the shipping containers for evidence of rough handling or damage such as deep cuts, dents, or broken fasteners. Make

certain that shipping container is intact. If there is evidence of damage to the container, the components must be inspected carefully before stowing or before assembly. If a motor in its container is dropped 6 inches or more, it shall be disposed

of according to regulations. (See paragraph 5-6 for disposition of damaged components.)

4-5 STOWAGE

4-5.1 GUIDANCE AND CONTROL GROUP. Two GCGs are shipped in the Mk 241 container. Six containers may be palletized on the Mk 7 Mod 0 pallet. GCGs are stowed in their shipping containers until ready for actual assembly.

4-5.2 FUZES. Four TDDs are shipped in Outer Container Mk 129. Twenty S-As are shipped in Outer Container Mk 2. TDDs and S-As are stowed in their shipping containers until ready for actual assembly, and are stowed in the GCG stowage compartment for ready assembly.

4-5.3 WARHEAD. Two warheads are shipped in Container Mk 386. When received, the warheads are removed from the container and placed in appropriate HE stowage areas.

4-5.4 MOTOR. One motor is shipped in steel Container Mk 287. The motors are removed from containers and stowed in appropriate magazines on approved stanchions, in the horizontal position only.

The estimated storage life of the Mk 36 motor is 5 years within the limits of -65 to +165°F.

4-5.5 WINGS AND FINS. These components can be stowed in inert stowage areas.

Chapter 5

OPERATION

The assembly of the AIM-9D missile shall not start until all team members have been briefed on the details of each step. Two team members are required to assemble the weapon; three members are required to load the missile on the aircraft. Only those tools specified in chapter 1 are to be used in the assembly operation.

5-1 DECANNING

In the breakdown area, the motors, warheads, wings, and fins are removed from their containers and inspected. Disposition instructions for damaged units are given in paragraph 5-6. The motors are moved on the Aero 8C-1 adapter to approved stowage areas and placed on stanchions in the horizontal position only. The warheads, wings, and fins are decanned and moved on the Aero 9B adapter to appropriate stowage—warheads in HE magazines, fins and wings in inert stowage areas. The TDDs, S-As, and GCGs in their containers are moved to the GCG stowage compartment and remain in containers until ready for actual assembly operation.

5-2 GCG AND FUZE ASSEMBLY OPERATION

5-2.1 IR FUZE CONFIGURATION. In the stowage compartment for the GCG, the transport tray is set up on a bench and the GCG-IR fuze assembly is as follows:

1. Remove GCG Mk 18 (with IR TDD attached) from its container and strap it on transport tray, figure 5-1a.

NOTE: The center slots are for the Mk 18 GCG; the others are for the Mk 12 GCG of the AIM-9C.

2. Place dome cover on nose of GCG, figure 5-1b.

WARNING

No electrical checks are to be made on the S-A by handling personnel.

CAUTION: Detonators in the S-A are of the bridgewire variety and are not safe when subjected to current of more than 5 ma. For example, a Simpson meter delivers enough current during tests to initiate the detonators.

3. Remove S-A from container and examine it carefully for damage.

WARNING

The S-A contains sensitive explosive and must be handled with care. Do not drop the S-A or attempt to assemble an S-A to a TDD if the S-A has been damaged, has

been dropped, or is suspected of having been dropped. Such an S-A shall be repacked and instructions for its disposition requested from the Bureau of Naval Weapons. No tests, adjustments, or checkout procedures shall be made by handling personnel, except visual inspection of the SAFE-ARMED indication in the window of the S-A. Always grasp the S-A at the end close to the retainer ring. Keep handling of the S-A to a minimum.

The next step is a two-man inspection.

WARNING

Do not use an S-A if by visual inspection (a) it is found to be in the ARMED position, or (b) it cannot be determined to be in the SAFE condition.

4. Inspect SAFE-ARMED window to determine that letter "S", indicating SAFE, is visible, figure 5-1c. On the basis of this inspection, the following action shall be taken.

a. One team member makes a signed entry on the attached inspection tag, indicating that the unit was examined and found to be safe.

b. If the letter "A", indicating ARMED, or if no letter is visible in the window, the S-A shall be disposed of immediately in accordance with existing regulations. A report, together with the inspection tag, will be forwarded to the Bureau of Naval Weapons.

If under paragraph 4a above, the S-A is safe, proceed as follows:

5. Remove plastic caps from circular female connector at aft end of TDD and from 6-pin circular male connector at forward end of S-A. Inspect connectors to make sure they are dry, clean, and free of grease and dirt.

WARNING

When the S-A is assembled to the GCG and TDD, the unit shall be handled with the care given any item of explosive ordnance.

6. Align stud on 6-pin male connector at forward end of S-A slot with slot on female connector at aft end of TDD, and mate two connectors, figure 5-1d.

7. Screw threaded retainer ring of S-A into threaded receptacle on TDD and tighten firmly with spanner wrench.

8. Hand-carry assembled GCG and fuze to assembly area or to dumbwaiter. If protective tape is not over windows of TDD, place cover on TDD.

NOTE: Four GCG-fuze assemblies on trays can be placed in dumbwaiter.

5-2.2 RF FUZE CONFIGURATION. If an RF TDD is required for the mission, the IR TDD (which comes attached to the GCG) must be replaced with an RF TDD. The procedures are as follows:

CAUTION: A cable connects the TDD with the GCG, and lockscrews on the cable plug must be removed before the TDD is separated completely from the GCG. Use care in removing the TDD. Do not

damage the TDD or the windows of the TDD.

1. Loosen clamp ring from forward end of IR TDD and carefully pull TDD from GCG. Remove lockscrews that hold electrical connections together.

2. Place IR TDD removed from GCG in proper container.

NOTE: An IR TDD shall not be placed in a container that has been used for an RF TDD or vice versa.

CAUTION: Lift TDD by its forward end. Do not pull on plastic bag alone.

3. Remove RF TDD from outer container. Place TDD in its inner plastic bag on smooth surface, cut top of bag, and remove TDD.

CAUTION: Do not remove the protective tape from the windows of TDD, and do not remove the red plastic cap from the electrical connector.

4. Place O-ring in groove of TDD mating ring if one is not there. Check to see that O-ring fits snugly.

5. Inspect 9-pin plug to make certain it is dry, clean, and free of grease and dirt. Line up GCG cable and its female connector with 9-pin rectangular male plug on forward end of TDD.

6. Connect plug and female connector at end of cable to GCG. Press firmly to make sure that connectors fit together securely, thus assuring good electrical connection.

7. Secure screws that hold plug and connector together.

8. Tighten clamp ring between GCG and fuze, using torque wrench.

9. Attach S-A, following steps 3 through 7 of paragraph 5-2.1.

10. Hand-carry assembled GCG and fuze to assembly area or to dumbwaiter.

5-3 ASSEMBLY AREA OPERATION

The assembly stand is removed from the bulkhead and set up by inserting tongue of leg in slot of saddle assembly, rotating leg until joint is engaged, tightening setscrew in flange of saddle assembly, figure 5-1e, and then tying down the stand.

WARNING

Do not alter or attempt to repair any part of the motor or igniter. Avoid jarring or dropping the motor. A cracked grain may cause motor blowup on firing. Do not use a motor that has been dropped or has a damaged (punctured or cracked) nozzle weather seal. Do not probe or punch weather seal with fingers or tools. Reject any motor that has been dropped or damaged, and dispose of it in accordance with existing instructions.

1. Inspect the motor before assembly. If there is evidence of any form of damage, reject the motor. Proceed as follows:

a. Examine forward closure for safe condition of igniter as follows—that forward hanger skid protector is in place and that both electrical leads from forward hanger are intact and attached to RIF terminals.

b. Inspect forward clamp ring for damage.

c. Inspect forward head retaining ring to ensure that none of the castellations have been sheared and that the forward head has not been displaced in shipping and handling.

d. Visually inspect exterior of motor tube for corrosion, rust, dents, nicks, or evidence of damage, rough handling, or deterioration.

e. Inspect wing ribs for damage or irregularities.

f. Inspect all three hangers for evidence of damage or mishandling.

g. Inspect nozzle exit cone and weather seal for cracks or punctures.

2. Place motor in two "V" supports of assembly stand, and position motor with launching lugs up, figure 5-lf. Secure motor on stand with center band.

WARNING

The warhead is potentially dangerous ordnance material and should be handled in accordance with existing ordnance regulations for Class A explosives. Do not perform any alterations on the warhead or attempt to disassemble any of its parts. If a warhead is damaged, it shall be disposed of in accordance with local instructions.

3. Inspect recess of warhead to verify that black rubber ring is cemented in bottom of recess.

NOTE: This ring cushions S-A. If not in place, do not use warhead. Return it to issuing depot with a description of the deficiency.

4. Insert warhead into forward end of motor so that alignment pin mates

with slot provided (see arrows on motor and warhead).

NOTE: Some pressure will be required to overcome the force of the compression springs supporting the non-propulsive head closure and to achieve proper mating.

5. Torque clamp ring socket-head screw to 100 inch-pound, using torque wrench, figure 5-lg.

CAUTION: Failure to assemble mating parts properly can result in rocket motor failure and missile breakup near the firing aircraft, which may cause missile components to strike the aircraft.

6. Align assembled GCG-fuze combination with warhead-motor combination, and gently slide front section aft, fitting aft end of S-A carefully in opening of warhead recess. Tighten clamp ring between fuze and warhead, using torque wrench, figure 5-lh.

7. Position wings in ribs at rear of motor, using speed wrench; tighten setscrews at aft end of wing ribs (see figure 5-lh). Never force a wing onto a wing rib.

NOTE: In disassembly of the missile, setscrews are to be unscrewed approximately 1/2 inch.

8. Attach fins to GCG, figure 5-li.

NOTE: The Mk 18 GCG has quick-attach fins that can be assembled to the GCG without tools. However, when these fins are removed, a socket-

head wrench is used to rotate the socket heads and release the fins. (Instructions are on each fin.)

9. Place assembled missile, figure 5-1j, on Aero 12B bomb skid with Aero 8C-1 adapter.

NOTE: The Aero 8C-1 adapter will hold four assembled missiles.

5-4 SEQUENCE OF ASSEMBLY STEPS AND MANPOWER REQUIREMENTS

Table 5-1 presents step-by-step procedures and manpower requirements. Figure 5-1 shows the step-by-step assembly.

Table 5-1. Assembly Procedures and Manpower Requirements

Steps 1 through 6 are performed in the GCG stowage compartment. Two men are needed.

Step No.	Team Member No. 1	Team Member No. 2
1	Remove GCG from container. Strap on transport tray.	
2	Place dome cover on GCG.	
	If IR TDD is to be replaced by RF TDD, the following steps are performed before S-A is attached, or RF TDD is to be attached to GCG Mk 12.	
3a	Remove RF TDD from outer container. Place TDD in inner plastic bag on smooth surface and cut top of bag. Remove RF TDD from inner plastic bag.	Loosen clamp ring from forward end of IR TDD and carefully pull TDD from GCG. Remove lock-screws that hold electrical connections together.
3b	Place IR TDD, removed from GCG, in proper container.	Place O-ring in groove of TDD mating ring if none there. Inspect 9-pin plug on forward end of TDD to see that it is free of dust, grease, etc. Line up GCG cable and female connector with 9-pin male plug on forward end of TDD. Connect plug and female connector. Press firmly to make good electrical connection. Tighten clamp ring, using torque wrench.
4	Remove S-A from container. Inspect S-A window for safety.	Confirm safety of S-A window.
5	Make S-A inspection entry on attached inspection tag.	Remove plastic caps from ends of TDD and S-A. Assemble S-A to TDD which is attached to GCG.
6	If protective tape not on TDD, place cover on TDD.	Hand-carry GCG fuze assembly on transport tray to dumbwaiter or assembly area.

Steps 7 through 12 are performed in the assembly room. Three men are needed.

Step No.	Team Member No. 1	Team Member No. 2	Team Member No. 3
7	Remove assembly stand from bulkhead and set up.		
8	Inspect motor and place on stand with launching lugs up.		
9	Inspect warhead recess for black rubber ring. Assemble warhead to motor, using torque wrench to tighten clamp ring.		Assemble wings to motor, using speed wrench.
10	Take GCG-fuze combination from tray. Attach to warhead-motor combination. Using torque wrench, tighten clamp ring.		
11	Attach fins to GCG.		
12	Place assembled missile (with dome cover and, if required, TDD cover) on bomb skid with Aero 8C-1 adapter to be moved to aircraft.		

5-5 MISSILE-LAUNCHER OPERATION

All nonessential personnel should be cleared from the immediate area of the launcher operation.

For missile-launcher assembly, three team members are required. These procedures are illustrated in figure 5-2. Procedures for ground operation of the LAU-7/A launcher are as follows:

NOTE: Tests of the launcher for proper operation and stray voltage checks (see chapter 6) are made before the following steps are begun.

5-5.1 LAU-7/A LAUNCHER GROUND OPERATION. The ground operation of the LAU-7/A launcher is discussed in four phases: (1) coolant-tank installation, (2) missile loading and catapult operation, (3) missile unloading, and (4) coolant-tank removal.

5-5.1.1. Coolant-Tank Installation. When an AIM-9D missile is to be carried aboard an aircraft, a coolant tank containing pressurized gas or air must be in the aircraft launcher. The pressure of the coolant tank must be checked against the following limits:

Less than 2200 psi at approx. 70°F or above	Unacceptable because of insufficient gas
2200 to 3000 psi at approx. 70°F or above	Acceptable for restricted flight
3000 psi at 70°F	Acceptable for unrestricted flight
3500 or more at 70°F or below	Unacceptable because of excess gas

NOTE: Time limits for restricted flights will be established by the squadron operations officer.

The indicator gage (see figure 2-8) at the aft end of the coolant tank is divided into four color bands that indicate the pressure. These bands are as follows:

Red	0 to 2199 psi
Yellow	2200 to 2999 psi
Green	3000 to 3499 psi
White	3500 or more psi

No gradations are marked on the bands. Readings made from this gage are approximate.

For the LAU-7/A launcher, a tank charged to normal operating pressure of 3000 psig contains a 3-hour supply. When it is necessary to charge a coolant tank, it must be removed from the launcher and filled, using the passive filtration and charging unit. After filling, the tank is again placed in the launcher or it is stowed in an appropriate stowage compartment until ready for use.

CAUTION: Handle coolant tanks with care at all times. It is essential that the seal valve at the forward end of the coolant tank be kept free of sand, dust, oil, grease, water, and other contaminants. NEVER APPLY ANY OIL, GREASE, OR OTHER LUBRICANTS TO THE LARGE THREADS ON THE SEAL VALVE.

To place the coolant tank in the launcher, proceed as follows:

1. Unlatch and rotate the handle of launcher aft fairing to the horizontal position and pull aft fairing back approximately 1/2 inch, figure 5-2a.

NOTE: The fairing opens with a clamshell action and is held open by springs loaded outward.

2. Release coolant-tank retention clamp on launcher.

3. Insert coolant tank into launcher, figure 5-2b. Guides within the launcher housing position the tank so that the threads at the forward end of the tank engage those of the seal valve.

NOTE: Normally, the coolant tank fits easily into the launcher without using special tools. If necessary, however, the bottle wrench, figure 5-2c, can be used. As the tank is screwed into the launcher, a probe forces the pin in the filter cartridge against the seal valve in the tank and allows the gas to flow from the tank.

4. Rotate coolant tank in clockwise direction until it is snug, figure 5-2d.

5. Secure coolant-tank retention clamp.

CAUTION: Never leave the launcher unattended with the aft fairing open.

6. Close aft fairing, push fairing forward, and rotate handle forward, figure 5-2e, until fairing is latched.

5-5.1.2. Missile Loading. If possible, the aircraft should be pointed toward a clear area, away from other aircraft and structures. The steps for loading the missile on the launcher are as follows:

WARNING

Do not stand directly in front of or behind the missile during loading operation. Stand clear of the launcher at all times after the missile is loaded on the launcher. VERIFY the safe condition of the launcher and aircraft before loading the missile on the aircraft by checking each of the following conditions:

a. Make certain that combination detent wrench—safety pin is installed properly.

b. Verify that cockpit switches are in the following positions:

MASTER ARMAMENT switch . . .	OFF
COOLING switch	OFF
ARMAMENT SELECTOR switch . . .	OFF

c. Verify that aircraft engines are OFF and that auxiliary power is NOT connected to aircraft.

d. Ground the aircraft.

After these checks are made, proceed as follows:

1. Position missile so that lugs enter three slots in launcher rail. Turn detent wrench—safety pin to raise detent. Slide missile forward into position and release detent wrench—safety pin, figure 5-2f. Never force a missile on the launcher.

CAUTION: Do not use excessive force or supplemental leverage in depressing the nose button.

2. Depress nose latch button and slide nose fairing forward.

3. Check umbilical hook for damage, then attach umbilical hook to missile umbilical block by pushing hook down until it snaps into place over umbilical-block pin.

CAUTION: The forward-receptacle dust cap must be kept in place on the launcher-power-supply receptacle at all times when a missile is not installed on the launcher. The upper-receptacle dust cap must be on the aircraft-pylon receptacle on the launcher top side **WHENEVER** the launcher is removed from the aircraft.

4. Remove forward-receptacle dust cap shown in figure 5-2g and connect missile umbilical cable to launcher-power-supply receptacle.

NOTE: When an AIM-9B missile is installed, an adapter must be placed between the missile umbilical cable and the launcher-power-supply receptacle.

5. Push nose fairing home. Remove dome and TDD covers and rolleron caps from missile, figure 5-2h, just before taxiing forward.

6. Pull detent wrench-safety pin just before aircraft catapulting.

5-5.1.3. Missile Unloading. When the aircraft returns from its mission with AIM-9D missiles aboard, the following operation shall be performed before the missiles are unloaded. The following checks are necessary for safe unloading operation:

a. Insert detent wrench-safety pin into launcher as soon as possible after aircraft lands.

b. Turn aircraft engines OFF. Verify that cockpit switches are in the following positions:

MASTER ARMAMENT switch . . . OFF
COOLING switch OFF
ARMAMENT SELECTOR switch . . . OFF

c. Ground the aircraft.

d. Place TDD cover on missile.

e. Place dome cover on GCG of missile.

f. Place plastic caps on wing rolleron.

WARNING

Do not stand directly in front of or behind the missile during unloading operations.

After the checks are made, unloading of the missile proceeds as follows:

1. Depress nose latch. Pull nose fairing forward and disconnect missile umbilical cable from launcher-power-supply receptacle. Place dust cap on forward receptacle. Disconnect umbilical hook. Close nose fairing.

2. Open handle on aft fairing, which automatically releases rear snubbers.

3. Turn detent wrench-safety pin to raise detent.

4. Support missile firmly and slide it aft until it drops through launcher loading slots.

WARNING

DO NOT REMOVE the detent wrench-safety pin.

5. Place missile on bomb skid with Aero 8C-1 adapter and return missile to ready-service stowage or

disassemble and return components to proper stowage areas.

5-5.1.4. Coolant-Tank Removal. To remove the coolant tank from the LAU-7/A launcher, proceed as follows:

1. Unlatch and rotate handle of launcher aft fairing to horizontal position and pull aft fairing assembly back approximately 1/2 inch.
2. Release coolant-tank retention clamp.
3. Rotate tank in a counterclockwise direction until forward threads of tank are disengaged.
4. Pull tank straight out of launcher.

5-6 HANDLING AND DISPOSITION OF PHYSICALLY DAMAGED AIM-9D MISSILE COMPONENTS

Each component of the AIM-9D missile shall be visually inspected before and after assembly. Specific instructions are as follows:

5-6.1 GUIDANCE AND CONTROL GROUP. Return to the depot any GCG that has a cracked, pitted, or stained dome (one that warm water and a detergent will not clean), or one that is rejected when tested on the Test Set, Guidance-Control Mk 409 (see chapter 6).

5-6.2 FUZE. Dispose of, in accordance with regulations, any fuze (TDD and S-A) that is damaged in any way that prevents assembly to other components, especially if threads or walls are damaged.

5-6.3 WARHEAD. Give particular attention to the ends, cavities, and outer walls of warheads. Dispose of, in accordance with regulations, any warhead that is damaged in such a way that it prevents assembly with other components of the missile.

5-6.4 MOTOR. Dispose of, in accordance with regulations, any bare motor that has been dropped or damaged. Dispose of any motor in its container that has been dropped 6 inches or more.

5-6.5 WINGS AND FINS. Do not use bent or damaged wings or fins. Dispose of, in accordance with regulations, any wings or fins that are damaged so that assembly cannot be made. Do not use wings with damaged rollerons.

5-7 HANDLING AND DISPOSITION INSTRUCTIONS FOR MISFIRED AIM-9D MISSILES

If jettison fails or the pilot elects to return with a misfired AIM-9D missile, the following precautions shall be taken before landing:

1. Place armament selector switch in OFF position.
2. When flight operations permit, wait at least 10 minutes from the time that the trigger is last depressed before landing the aircraft with a misfired missile aboard, or follow local command instructions.

The following additional precautions shall be taken after landing:

1. After aircraft has landed with a misfired AIM-9D missile aboard, put the detent wrench-safety pin in place immediately and spot aircraft in a safe position, pointed toward a clear area.
2. Wait at least 10 minutes before unloading the missile.
3. Disassemble missile following the reverse of the procedures in paragraphs 5-2 through 5-4. Inspect each component as it is disassembled. Dispose of damaged components in accordance with applicable regulations. The GCG must be tested on the Mk 409 test set (see chapter 6).

The TDD must be sent to the appropriate ammunition depot for further disposition. The S-A must be inspected; if the "S" in the window shows, it can be reused. If not, it

must be disposed of immediately in accordance with existing regulations. The motor is disposed of in accordance with existing regulations.

Chapter 6

MAINTENANCE AND TESTING

The AIM-9D missile and the LAU-7/A launcher have been designed for minimum maintenance and testing. However, failures may occur as a result of normal operational use, shipping, handling, or stowing; and, at regular intervals, the operational suitability of the missile, the launcher, or the aircraft may need to be checked. For these reasons, test equipment has been provided to meet this need.

6-1 TEST SET, GUIDANCE-CONTROL MK 409

The Mk 409 test set is used to check the operational suitability of the GCG Mk 18 of the AIM-9D. Figure 6-1 shows the Test Set, Guidance-Control Mk 409 with the GCG in place for checking. The test set is a single unit that (1) affords a mount for the

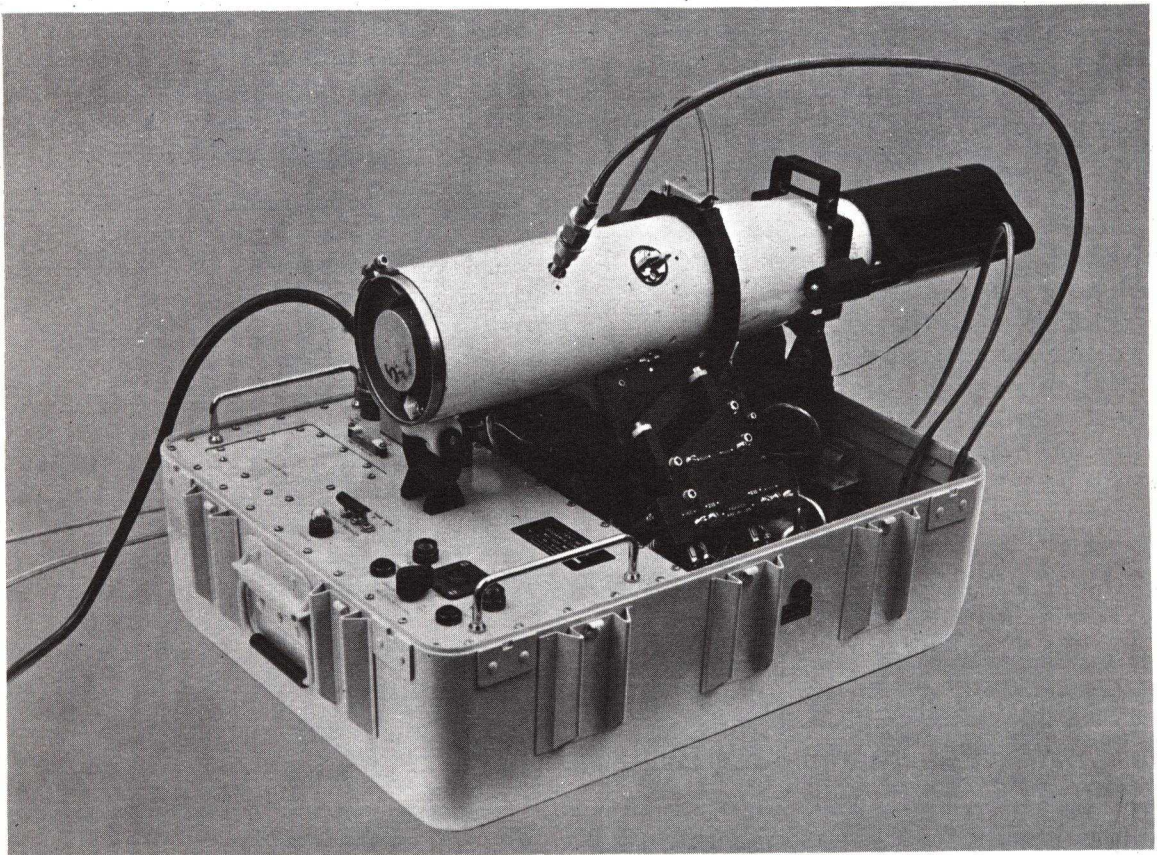


Figure 6-1. Test Set, Guidance-Control Mk 409 With GCG in Place.

GCG, (2) connects the GCG to electronic circuitry, and (3) operates to provide specific electrical signals to the GCG. Indicators and controls on the electronic control panel show whether the GCG response to these signals is within the proper range of values.

Each GCG is tested on receipt and is again checked every four months. A record of tests is maintained, and a report of an unacceptable GCG is forwarded with the unit to a QEL (Quality Evaluation Laboratory.)

The test set is a combined mechanical and electronic testing unit enclosed in a two-piece metal waterproof case consisting of a bottom half, where the fixed components are mounted, and a deep, removable cover with straps and brackets to hold various attachments. These attachments are a plastic nose cap, a nipple for hose coupling to the GCG, four fin stubs, two socket-head (Allen) wrenches (5/32 and 3/16 inch), a power cable, a Frahm frequency meter (120-130 cycles per second), and a frosted-screen alignment jig for the light source. All of the electronic components are of modular plug-in construction and are mounted on a frame beneath a splash-proof control panel at one end of the bottom case. When this panel is removed from the bottom case, all of the modular components are exposed for maintenance. The main mechanical components of the test set are mounted on a metal plate raised 2 1/2 inches above the level of the case bottom.

The test set in its case weighs approximately 100 pounds and is 26 inches long, 20 inches wide, and 16 inches high. It is its own shipping container.

Instructions on the use and maintenance of the test set are given in NAVWEPS 17-15MBD-1, and a copy

of these instructions is issued with each test set.

6-2 GUIDED MISSILE LAUNCHER TEST SET AN/ASM-20

The AN/ASM-20 test set is used to test the electrical circuits of the AIM-9D missile launcher (LAU-7/A) with the launcher installed on the aircraft; to test the gas pressure system of the AIM-9D, both electrical and static pressure; and to test the AIM-9D electrical circuits of the aircraft with the missile launcher removed.

The test set, figure 6-2, has the following components: (1) transit case, (2) test set, (3) cable assembly, (4) set of four adapters, (5) pressure gage, and (6) hexagonal wrenches. A pilot's headset compatible with the aircraft being tested and an auxiliary power source to energize the aircraft circuitry must be available.

The components of the AN/ASM-20 test set can be used separately, or jointly, to perform several tests. The three basic test setups are outlined in the following paragraphs:

6-2.1 MISSILE-LAUNCHER TEST.

The test set, cable assembly, and correct adapter are required to perform this test. The test checks the circuits of the aircraft and launcher that are used during standby and firing of the AIM-9D and AIM-9C missiles, as well as the AIM-9B. It also checks the circuits of the aircraft and the launcher that are used in jettisoning the missiles.

6-2.2 GAS PRESSURE TEST. The pressure tester is the only item of the AN/ASM-20 equipment required to make this check on the AIM-9D missile.

6-2.3 AIRCRAFT-CIRCUIT TEST.

The same items of equipment are used in this test as in MISSILE-LAUNCHER TEST (paragraph 6-2.1), except that a different adapter is required. This test is made when the launcher is not attached to the aircraft.

6-2.4 INSTRUCTION CARDS.

Instruction cards covering all three types of missiles (AIM-9B, 9C, and 9D) and power supplies required, along with a copy of the handbook on the preparation and use of the Guided Missile Launcher, Test Set AN/ASM-20 (NAVWEPS 16-30ASM-20-1), are included with each test set.

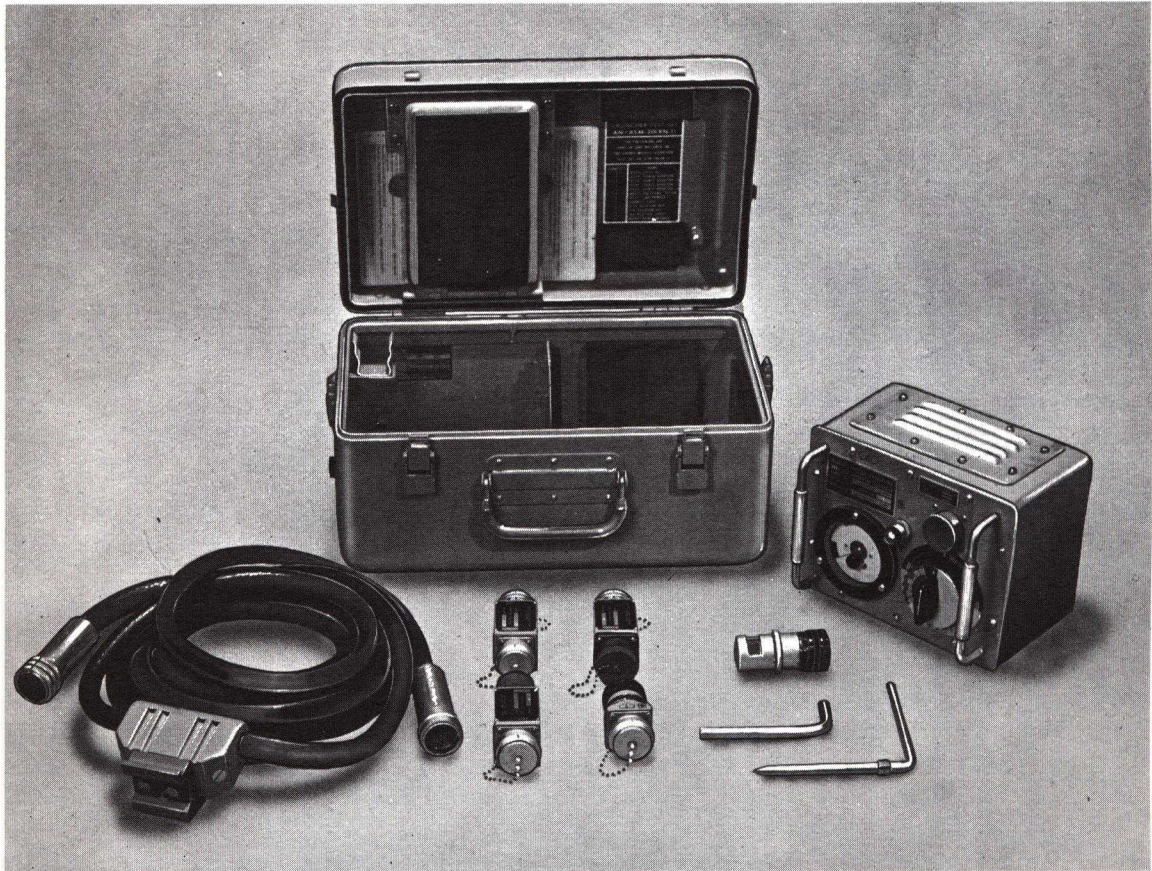


Figure 6-2. Guided Missile Launcher Test Set AN/ASM-20.

CAUTION: The AN/ASM-20 test set is susceptible to high level electromagnetic radiation. Under such an environment, test readings are unreliable. (Modifications to eliminate this problem are being developed.)